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ABSTRACT

This environmental education activities package for grades 3-5 contains activities in the following curriculum areas: (1) social science; (2) science; (3) language arts; and (4) mathematics. The activities are divided into seven sections based on seven environmental topics: (1) ecosystems; (2) population; (3) energy and resources; (4) economics, technology and culture; (5) environmental quality; (6) environmental policy; and (7) environmental ethics. Each activity gives the curriculum topic, the environmental topic, a list of skills exercised in the activity, the subject, grade level, the location necessary to carry out the activity, the author, the objective, background information for the teacher, materials, a vocabulary list, and some related activities and resources. (BB)

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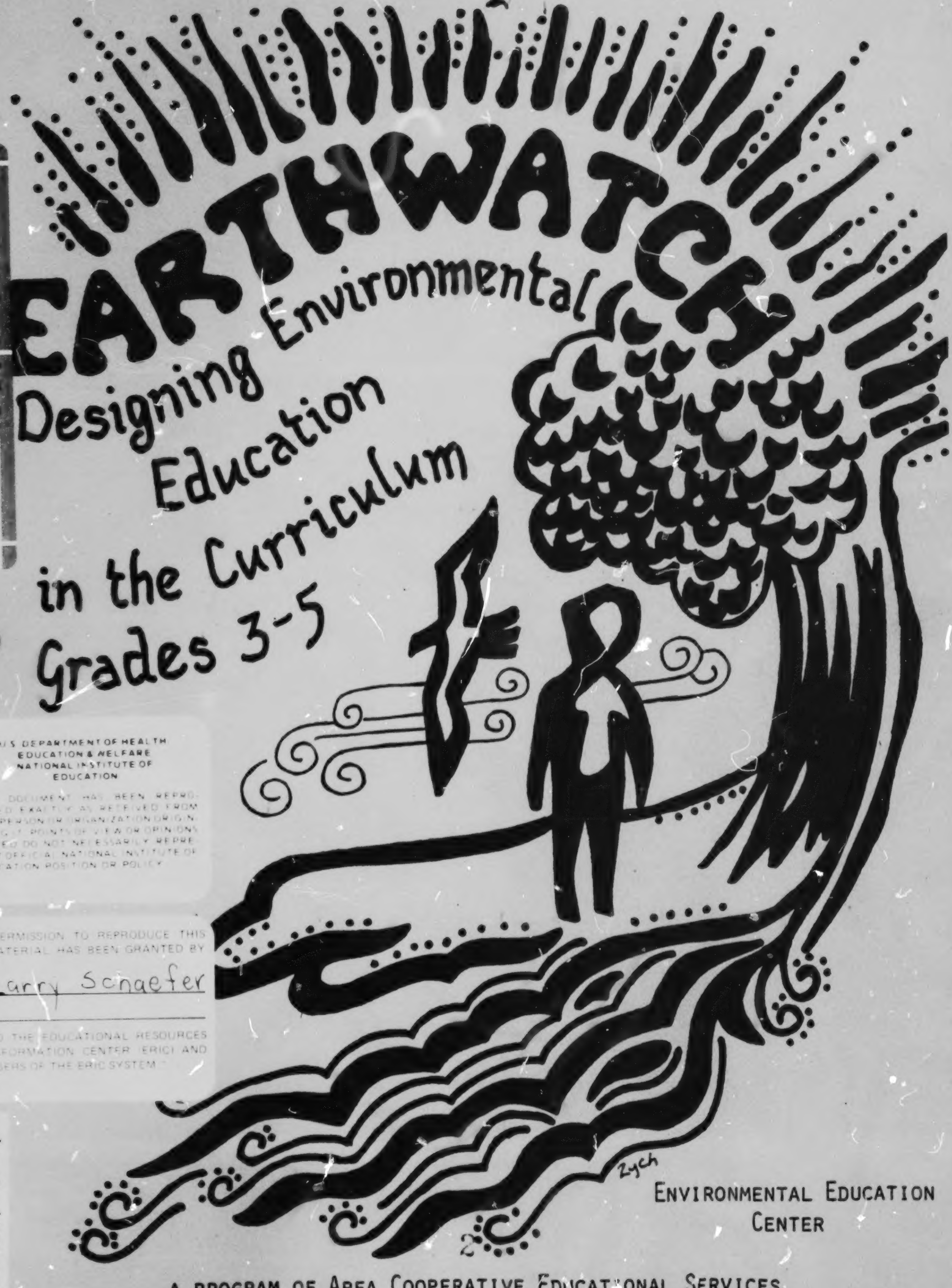
EARTHWATCH

Designing Environmental Education in the Curriculum Grades 3-5



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ENVIRONMENTAL EDUCATION
CENTER

A PROGRAM OF AREA COOPERATIVE EDUCATIONAL SERVICES

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EARTHWATCH

DESIGNING ENVIRONMENTAL EDUCATION INTO THE CURRICULUM

VOLUME I

grades 3 - 5

produced by

Environmental Education Center

a program of Area Cooperative Education Services

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To The Children

may their world be full

INTRODUCTION

"My interest is in the future, because I am going to spend the rest of my life there."
-- C. F. Kettering

Due to national and international developments during the 1960's such as deterioration of air and water quality, soaring gasoline prices, contaminated drinking water, and depletion of natural resources, educators came to realize the need for introducing students to relevant concepts directly related to environmental issues. Striving to serve the needs of society, a new dimension called "environmental education evolved during the latter part of the decade. Most educators agreed that environmental education should be dedicated to producing environmentally literate citizens. In other words, such a process should produce citizens equipped with factual and unbiased information concerning the basic ecological systems, skilled in problem-solving and decision-making and motivated to take an active role in working toward the maintenance of an ecologically-sound environment.

The ultimate objective of involvement in an environmental learning program is to enable people to think reasonably and thoughtfully about their environment. This will come about through specific and continued experiences with their environment. Any single experience is not enough. In time, experiences will accumulate to the extent that students can visualize patterns and causes and effects which make sense to them and which relate to other aspects of life.

In order to reach this goal, it is important that students have environmental learning experiences on a continuing basis throughout their lives. There are basically two approaches to implementing environmental education to reach this goal:

1. Environmental education uses the skills and information of various disciplines.
2. Each discipline can use environmental activities to teach the knowledge and skills of that discipline.

The problem of the first approach is that if we continue to "take time out" from the everyday instructional program to deal with environmental problems, they will remain adjunct concerns. In addition, there is always the problem of one more unit in an already crowded program. On the other hand, if we prepare a program of instruction which is customized with or has environmental objectives built in, our attention to such concerns will be as regular and automatic as the social occurrence of the problems themselves. It is this second alternative that has been developed in this notebook of activities.

Infusion is not a new concept. It is in fact an integral part of the entire education process. Every teacher strives to integrate and piece together for their students the many topics, subjects and categories that divide the school day. Writing skills are not isolated exercises to be performed during an English lesson but are important tools of communication in science, social studies and the language arts.

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Our Environmental Education Infusion Project is a two-fold response to this aspect of the teaching process. In response to the crowded curriculum, the infusion approach frees a teacher to environmentalize their classroom to any extent. By selecting one or more EE infusion activities, a teacher can highlight the environment in key spots throughout the school year. And perhaps more importantly, by integrating environmental education into a multitude of disciplines and topic areas, the students' thinking comes to reflect an environmental ethic which spans the individual curriculum topics. Rather than viewing environmental education as a day to collect litter or as a bulletin board of pollution posters, students begin to apply their environmental awareness and knowledge in all their classroom activities and investigations.

The primary objective of the EEC Infusion Project was to closely link participating school district curriculums to opportunities in environmental education. These opportunities were identified by the EEC staff using school district curriculum guides and the EEC resource library and were integrated into a giant matrix. The horizontal axis recorded the sixty-five science and social studies curriculum topics gleaned from a careful analysis of school programs. The vertical axis, a framework for environmental education, was conveniently divided into seven major topics: Ecosystems, Population-People, Resources-Energy, Environmental Policy, Environmental Ethics, Environmental Quality and Economics, Technology and Culture. Using the matrix as a guideline, the two writing teams worked diligently to create and rework curriculum activities to highlight the environmental issues which emerged from these curriculum areas. The teams were teachers from participating school districts, Amity, East Haven, Stratford and Westport, as well as several other teachers who joined forces for an intensive period of curriculum writing. Ideas were formulated during team brainstorming sessions and writers cooperated to improve the quality of one another's work. The final products, two activity notebooks (one, grades 3-5 and the other grades 6-8) are titled Earthwatch.

Although this approach to the development of curriculum materials seems long and complex, it is based on the belief that by incorporating environmental education concepts into an on-going curriculum several benefits can be derived. First, continuation of environmental education instruction can be assured, without the necessity of massive external funding sources. Second, by incorporating these concepts at appropriate places in many areas of study, environmental eudcation can remain dispersed throughout the curriculum and not become a specific entity or source that should be taught at a certain grade level. This allows students to be introduced to environmental materials at all grade levels and in almost all subject areas in a subtle, yet reinforcing manner, assuring the transdisciplinary nature of environmental education. Third, by allowing teachers to introduce environmental concepts within the framework of the courses they are already teaching, their confidence in themselves and the materials can be maintained, and the need for extensive teacher in-service training can be kept to a minimum.

We understand learning to be a change in either behavior or in pattern of thinking which follows upon an accumulation of experience. Infusing environmental education into a variety of subjects and grades can provide the diversity of experiences for environmental learning while preserving the integral fabric of a curriculum designed to develop specific skills and content.

USER'S GUIDE

FINDING AN ACTIVITY

There are three procedures which may be used to utilize this notebook.

Option I

Turn to the list of curriculum topics in the Table of Contents on page . These curriculum topics are listed by discipline - social studies or science (additional disciplines may also appear). Choose an appropriate curriculum topic. After each curriculum topic are page numbers to identify activities which teach that topic.

Option II

Turn to the subject index at the end of the notebook. The index provides access to activities based on key words which best describe each activity. The appropriate page numbers follow each key word.

Option III

The activities are divided into seven sections based on seven environmental topics: (1) ecosystems (2) population (3) energy - resources (4) economics, technology and culture (5) environmental quality (6) environmental policy and (7) environmental ethics. Immediately following each environmental division in the notebook, there is a table of contents which lists the activities in that section by descriptive title and page number.

READING THE ACTIVITY

Each activity has an identical format. The most obvious section is the introductory box containing the Curriculum Topic (from your school district program) and the Environmental Topic around which the activity was designed. To enhance your reading of the activities, each section of the activity format is described on the following mock-up of the activity.

Curriculum Topic	as indicated.
Environmental Topic	one of seven environmental topics.
Skills	skills exercised in the activity selected from the Taxonomy of Skills (See Appendix).
Subject	as indicated.
Grade Level(s)	as indicated.
Site	location necessary to carry out activity.
Author	name of teacher designer.
Objective	desired outcome in the learner following completion of the activity.
To The Teacher	substantive information to: 1) provide background for the presentation of the environmental topic; 2) explain the connection between the curriculum topic and environmental topic.
Before You Begin	preparations, materials, and cautions to consider before implementing the activity.
Words To Know	a list of key terms for the student (vocabulary).
ACTIVITY	as focal point of the activity, this section contains the step-by-step procedure for carrying out the activity.
Related Activities	various related activities as ideas for subsequent lesson plans and follow-up.
Resources	references used in developing the activity. The EEC ** found at the end of a citation refers to a catalog number for the material at the Environmental Education Resource Library.
Credit	a source or person who made a significant contribution to the activity.
Notes To Myself	an empty section to be filled out by you. It is a place to make notes regarding your individual use of the activity.
STUDENT PAGE	pages referred to in the activity which can be duplicated and used by students for completion of the activity.

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INTRODUCTION TO ENVIRONMENTAL TOPICS

Accept this simple challenge: look around you, and name three things that are not part of your environment. The task, of course, is impossible. In its broadest sense, environment includes everything.

Yet environmental education cannot include everything. And while it cannot supplant such programs as outdoor education, or traditional disciplines such as biology or economics, neither can it accept the narrow focus of these subjects. Environmental education must be holistic without being overwhelming. To satisfy the human urge for simplification and classification, the Project Team has developed a conceptual scheme designed to encompass, in seven areas, the rubric "environment". The seven taxa are: Ecosystems; Population--People; Energy--Resources; Economics and Technology--Culture; Environmental Quality; Environmental Policy; Environmental Ethics.

While preparing the notebook, it became apparent that the writers tended to approach the environmental topics in two distinct clusters. The first set, Ecosystems; Population--People, and Energy--Resources represent constraints, the ecological boundaries within which environmental decisions must be made. They are the stimuli to a set of responses: Environmental Ethics and Environmental Policy which combine to determine our Environmental Quality. Economics, Technology and Culture are collectively the intersection of these two sets, for while they are in many ways determinants of our behavior they are also subject to resolute alteration.

The stimulus-response distinction is, of course, blurred. Energy may be a constraint within which we work, but conscious decisions can alleviate that constraint. This sort of interaction, however, precisely illustrates the first principle of environmental thought: everything is connected to everything else. So, even though our search for comprehensibility in the vastness of an interconnected universe leads us to classify and divide, the unity of environment remains. There can be no understanding of Ecosystems without understanding Environmental Ethics. No Environmental Policy fails to affect concerns expressed in the six other topics. World-wide banning of DDT, for instance, would drastically alter the balance between insects and their predators in the ecosystem (to the benefit of the predators!), affect efforts to reduce the mortality of human populations via mosquito control, change the inputs in agricultural production, alter the structure of demand for petrochemicals, reduce the level of toxic substances in the environment, and hopefully teach us a lesson about the unforeseen consequences of hasty acton. Which of the seven topics could a discussion about a ban of DDT conceivably be limited to? Obviously, it encompasses them all.

We feel that there is a logic and consistency to our framework. We recognize also that any number of topical divisions are acceptable. Our point in presenting environmental education in arbitrary slices is to help focus your thoughts. We hope it does not narrow them.

ECOSYSTEMS

ECOSYSTEMS

ACTIVITY TITLE PAGE NUMBER

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ECOSYSTEMS

As any living thing struggles to provide itself with the basic requisites of life--food, a place to live and bear young, a mate--it inevitably comes into contact with other living things. The different ways in which animals and plants interact with one another are innumerable.

These ecological relationships do not occur in a vacuum. They take place in a physical and chemical environment. This environment includes the oxygen and carbon dioxide in the atmosphere, water, inorganic minerals, and organic matter produced by the metabolism of living organisms and the decay of dead ones. It also includes physical properties such as moisture, wind, temperature, currents, and solar radiation. This physical-chemical (abiotic) environment and the living things (biota) that act within it comprise an ecosystem. "Ecosystems are real--like a pond, or a field, a forest, an ocean, or even an aquarium; they are also abstract in the sense of being conceptual schemes developed from a knowledge of real systems. In spite of the great diversity in types of actual ecosystems--from small to large, terrestrial to aquatic, laboratory to field--and in spite of the unique combinations of particular abiotic and biotic components in any particular one, there are certain general structural and functional attributes that are recognizable and to which attention can be directed." (Kormondy) One way of looking at ecosystems is to consider four of those major and universal attributes: limits, cycles, change, and interdependence.

Each ecosystem, even the global ecosystem, is limited. That is, there are only so many organisms an ecosystem can continue to feed and house. It takes the absence of only one particular environmental factor to become a limiting factor and life in the ecosystem is threatened. For example, the inability of sunlight to penetrate many feet of water limits the algal productivity of the deep sea no matter what the quantity of other key components. In functioning ecosystems, the biotic and abiotic components combine to set up a carrying capacity which determines the number of individuals the ecosystem can support.

The most pressing need of any organisms is to feed itself. Plants accomplish this by harnessing solar energy to build carbohydrates and other complex organic compounds. This process converts the sun's energy to chemical energy which the plant can then utilize for its growth, maintenance and reproduction. The ability of plants to use the sun's energy directly earns them the title producers. Animals, however, have no such ability. They must consume other living things to gain access to the sun's energy; hence the name consumers. Consumers--that is, they may be herbivores or carnivores. At each level of feeding along this food chain, however, there are losses--for instance, the loss of the energy stored in organisms which die and are not eaten and the inevitable energy loss which accompany the energy transfer at each feeding level. Ecologists have in fact measured these losses, which amount to about 90% at each step of the food chain. Thus the snake which ate the frog which ate the insect which ate the plant contains only about one-tenth of one percent of the energy originally present in the plants, which is why most food chains are no longer than four steps. Of course, since most animals eat more than one kind of food, there are many food chains in each ecosystem. By picturing the many predator/prey relationships in the ecosystem, the linked food chains are seen to form food webs which represent a richer picture of the ecosystem. The entire ecosystem is, of course, limited by the primary productivity of its plants, and the flow of energy in the system is unidirectional, from the sun to the plants through the food chain and then lost to the environment in a less useful form, heat.

But while energy flow is unidirectional, the flow of material in an ecosystem is cyclical. If the elements and compounds which make up organisms were forever bound up in those organisms upon death, the world would soon contain nothing but dead bodies. Dead plants and animals in fact decay, and the vital ecological role of decay is performed by bacteria, fungi, and other micro-organisms known collectively as decomposers. Decomposition reduces large organic molecules to simpler elements and compounds, freeing them for use by living organisms. As a simple example, the decomposition of dead plants on the forest floor provides soil nutrients for the new generation of plants.

Cycles are then convenient natural housekeepers and essential environmental organizers. Generally these cycles include both geological and biological parts. For instance, carbon as it moves through its cycle, passes through the food chain via green plants during photosynthesis and animals during respiration, and is occasionally stored in large quantities in the earth as fossil fuels. Humans are part of these natural cycles, and their technology often influences the cycling of materials to a far greater extent than necessary. It is the responsibility of humanity to avoid impairing the functioning of these natural cycles, or its dependence on the natural world will be dramatically and catastrophically demonstrated.

The cycles of the world continue in a seeming equilibrium. But in fact many of these cycles are undergoing continuous almost imperceptible change. Change--constant, significant, and often (though not always) directional--is a fundamental fact of life. No ecosystem is ever static. Animals and plants are dying or beginning life. Metabolic processes that keep organisms alive are ensuring a constant flow of material and energy.

In many ecosystems these changes tend to produce a sort of evolution called succession. Succession is a series of environmental changes which are caused by biological agents. For instance, in a pine forest, the ground is heavily shaded. Pine seedlings do not survive well under such conditions, but the seedlings of such trees as maples, oaks and beeches thrive. Over time, the densely shaded pine forest sows the seeds of its own destruction, and is replaced by a shade loving oak-hickory forest. This oak-hickory forest, called a climax ecosystem, seems to endure without significant alteration. But the climax is in fact a temporary plateau. In time, a fire or landslide or some other abiotic environmental change will inevitably occur and start the process all over again. Nothing in the environment is forever.

4

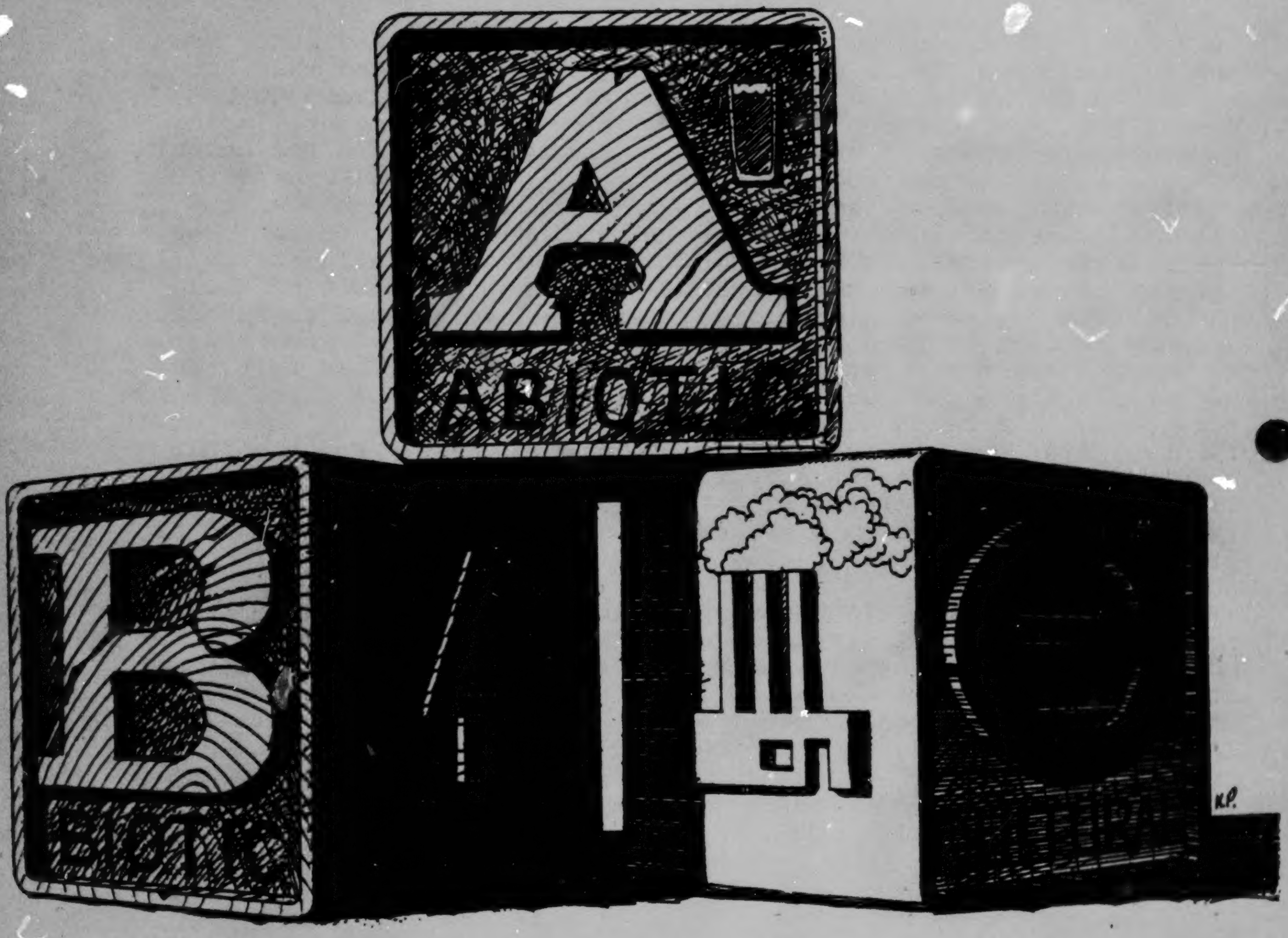
Even the nature of the organisms which inhabit an environment change over time. It takes eons, but gradually the pressures of competition and a changing environment favoring those individuals with the proper adaptions, alter the genetic composition of species. The theory of evolution is by now so well-known in at least its basic form that it would be inappropriate to restate it here. But the importance for ecology is that organisms well adapted to their environment represent the cumulative effect of ecological pressures over a long period of time. If eagles evolve sharp talons with which to catch prey, it is only because those eagles which, at some distant time in the past, lacked talons were unsuccessful predators and died.

Of course, if it were not for the rabbits, rodents, and other prey the eagles catch, there would be no eagles at all. And that brings us to the fourth fundamental characteristic of ecosystems to be discussed: interdependence. Every species--every species, including humanity--is dependent upon all other living things and the unliving components of the environment. Humankind could not survive without green plants, because there would be no oxygen to breathe without plants. Without birds to eat the insects there would be no forests. Man's interventions in the natural world have often failed to consider the connectiveness of the ecosystem. We thought we could control the insects better with pesticides than the birds could do naturally--and now we each carry a load of DDT in our bodies, and are returning to natural means to protect our crops and woodlands. We felt that we could achieve the good life by using the fossil fuels and are now struggling to stretch for a few more years the supply of energy that nature stored over the course of millions of years. The time has come when each action humanity takes must be considered carefully in light of its impact on the global ecosystem--for the evolutionary response of organisms to environmental change that is too rapid is still as it was for the dinosaurs, extinction.

If you carry nothing else from this survey of ecosystems, remember this: "Thou canst not stir a flower without troubling a star." Far more important than memorizing words like trophic level, species diversity, or plant association is developing an ecological way of thought. That thinking process begins when you ask, "What will happen if...", when you insist on seeing the whole picture, when you ask "Why is it that way?" In an age of specialization, those who look for relationships, patterns, and concepts enjoy a view from a height.

-Steve Gold

E. J. Kormondy, Concepts of Ecology, 1969, Prentice-Hall, Inc. New Jersey.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Checks and Balances

Curriculum Topic

AMERICAN HISTORY OR CIVICS

Environmental Topic

ECOSYSTEMS

Skills

defining problems
interpreting data

Subject

Social Studies

Grade Level(s)

5

Site

classroom

Author

Karen Ann Hayward

Objective

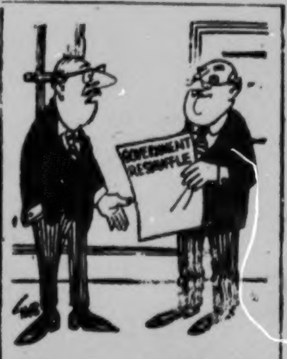
The student will be able to:

1. diagram the 3 branches of government showing the relationship between each and how they check and balance each other,

2. diagram an ecosystem's checks and balances

To The Teacher

When teaching the United States Constitution it is necessary to discuss the checks and balances that the political leaders who attended the Constitutional Convention built into their government to maintain stability.

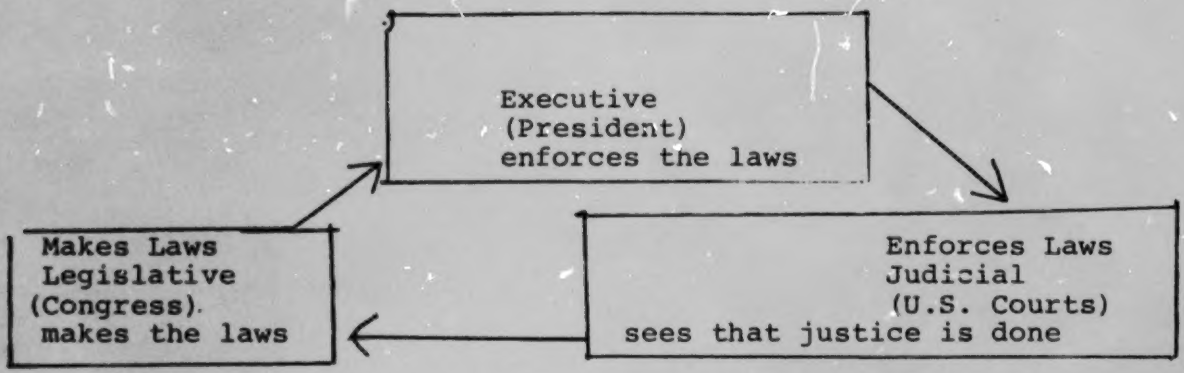


Courtesy LONDON TIMES

"After all my devoted years to the party, I'm offered a miner post. Environmental Pollution Department — Bad Smells Section."

Conservation News

These checks and balances within our government can be diagrammed as follows:

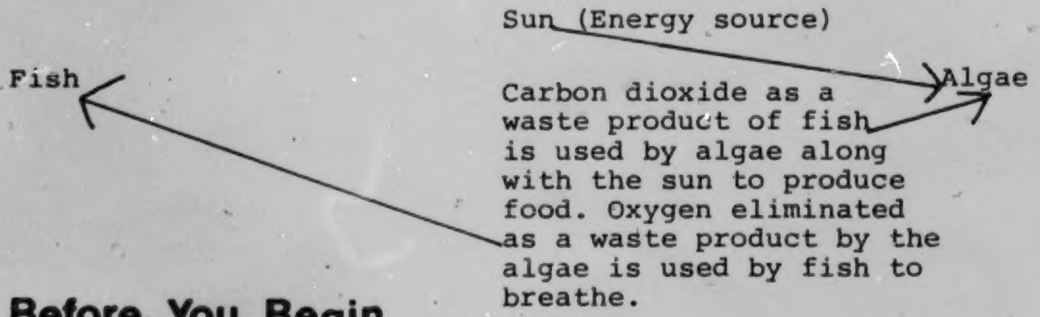

Executive
(President)
enforces the laws
Makes Laws
Legislative
(Congress).
makes the laws
Enforces Laws
Judicial
(U.S. Courts)
sees that justice is done

An analogy to this civics lesson is the checks and balances that an ecosystem employs. In this activity, the instructor presents the following ecosystem to the students:

Five sealed tanks that contain water and air.

1. A few fish and no algae.
   Fish will suffocate, so the oxygen is depleted.
2. No fish and some algae.
   Algae will die off as the plants need carbon dioxide provided by the fish as a raw material for life.
3. A few fish and some algae.
   This jar is the most likely to balance and become a stable ecological system.
4. A few fish and a lot of algae.
   This system may balance, plants may not have enough CO_2 and if they do not flourish, will die also.
5. Many fish and a small amount of algae.
   Fish may eat all algae at once and then starve.

The following checks and balances within the balanced ecosystem (jar #3) can be noted:


Sun (Energy source)
Fish
Algae

Carbon dioxide as a waste product of fish is used by algae along with the sun to produce food. Oxygen eliminated as a waste product by the algae is used by fish to breathe.

Before You Begin

Materials: fish tanks/water - sealable, fish (goldfish or guppies) algae (Elodea works well)

Words To Know

Ecosystem, balance, constitution

ACTIVITY

1. After a lesson on constitutional checks and balances, explain to the students that they are going to study another system of checks and balances.

2. With the help of the students, put together the five systems:

Tank #	Tank Contents	Probable Results
1	Fish, no algae	Fish die
2	Algae, no fish	Algae die
3	Algae and fish	Balanced system
4	Much algae, few fish	Unbalanced system
5	Little algae,many fish	Fish may deplete the algae supply

3. Let students observe the tanks for one week and note their observations each day.

4. Have students make a diagram of each ecosystem observed.

5. Lead a discussion of the checks and balances which operate in a natural ecosystem and compare and contrast these to the governmental controls.

Related Activities

Observe an ecosystem on the schoolyard with the class (a small pond, stream, or field). Brainstorm a list of ways that the members of the school and community impact or disturb the area being observed. Try to determine the possible consequences of each disruption.

Notes To Myself

Marine Life

Curriculum Topic
GEOGRAPHY BIOMES

Environmental Topic
ECOSYSTEMS

Skills
Reading, locating and obtaining information, using information for a purpose, communicating information, evaluating information

Subject
Social Studies

Grade Level(s)
3-5

Site
Classroom

Author
Antionette R. Giovannitti

Arthur C. Braun, Jr.

Objective
The students will be able to:

1. list the by-products and uses of seaweed,
2. discuss pros and cons of sea farming.

To The Teacher

All civilizations have been dependent upon the oceans and the marine environment for existence. There is growing concern that this valuable resource is being drastically altered. Marine life in a variety of forms has become a part of our daily lives.

This activity will make students aware of the value of seaweed as used in commercial products. The potential of seaweed as an important resource is great, and needs increased examination.

Before You Begin

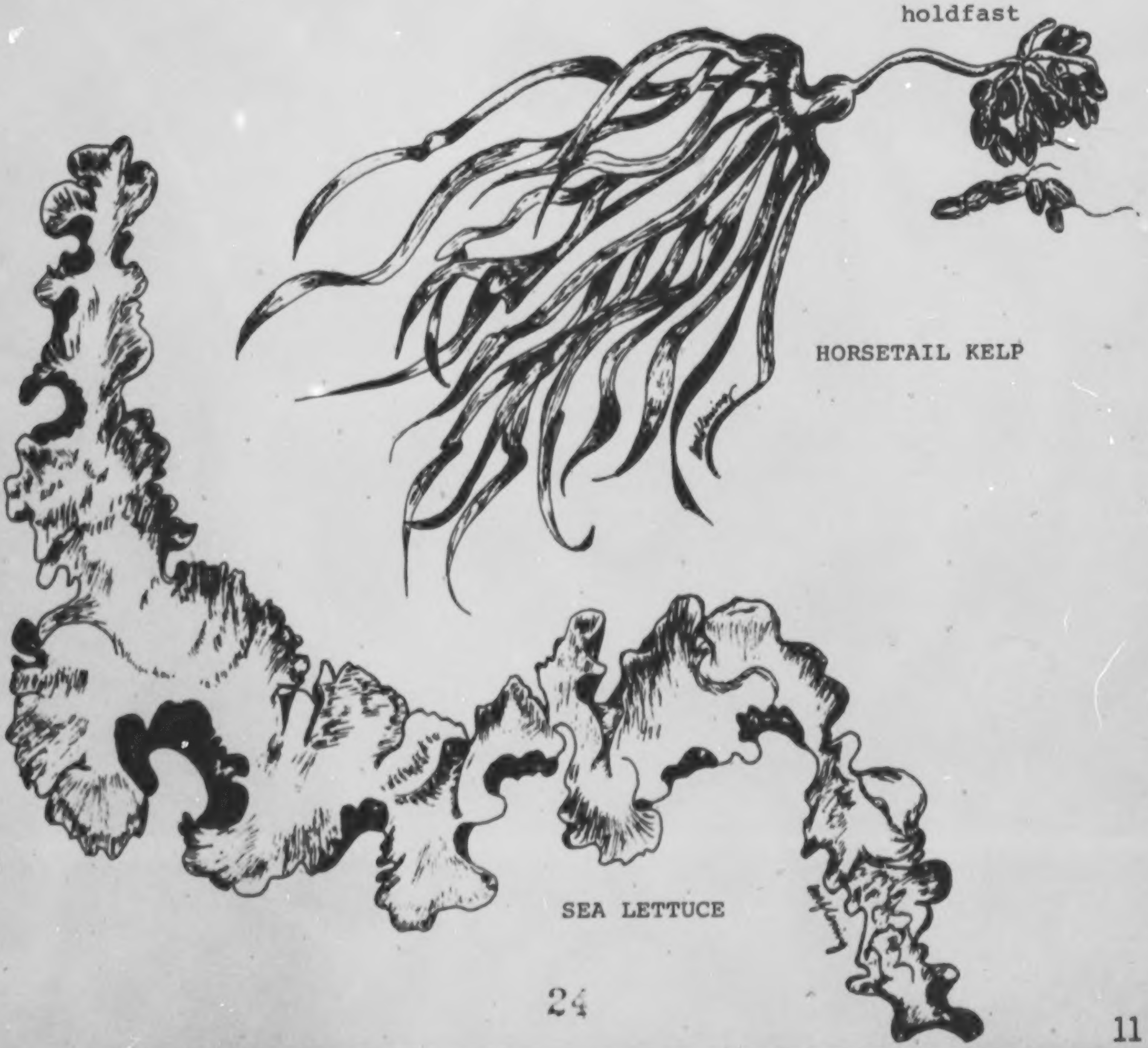
Preparation: Worksheets for each student: article, worksheets and pictures accompany activity.

Have available pictures of:
- giant bladder kelp
- sea palm
- sea lettuce

Students will need pencils

Words To Know

seaweed, bladder kelp, holdfast, anchored, blades, photosynthesis, debris, tropical paly, limply, predators, hydras, harvested, sea slugs, secures, sacs.



ACTIVITY

1. Distribute "Seaweed..." article to each student and read orally with the class. (Show pictures where necessary and discuss them with students.)

2. At conclusion of reading session, pass out worksheets to be completed individually.

Related Activities

1. Have students collect pictures from magazine of aquatic life and seaweed by-products.

2. Make a collage using these pictures.

Resources

Carson, Rachel, Silent Spring, New York: Crest.

Credit

"Useful Plants of the Sea", Marine Environment Curriculum Study, Fall, 1974, University of Delaware; EEC #886.

Illustration, Ann-Marie M. Fleming

Notes To Myself

STUDENT PAGE

Seaweed...useful plants of the sea
by Robert Dunne, Ranger Rick's Nature Magazine 4(7): 44-47

Have you eaten any seaweed today? You have if you ate some ice cream or cake frosting. You drank some too, if you had chocolate milk. Your father put seaweed on his face if he used shaving cream this morning. So did your mother if she rubbed lotion on her hands.

There are many things around your home that contain seaweed. You can't see it, but it's there. A little bit of it in chocolate syrup stops the chocolate from settling to the bottom of your glass of milk. It makes ice cream, shaving cream and hand lotion smoother and creamier.

Where does the seaweed come from? Let's find out by exploring a beach along the rocky Pacific Coast. A good time is right after a storm. The strong winds and currents have torn loose many seaweeds that grow out in the water. High waves have carried them to the beach, where they have been thrown up in great tangled piles.

One of the strangest seaweeds in the piles is the giant bladder kelp(illust.). It grows in deep water and may reach the height of a six-story building! Since it can add up to 18 inches a day to its length, it is the fastest-growing plant in the world.

There are many other kinds of kelp. All are brown-colored and grow anchored to the rocky ocean floor by holdfasts (roots). Kelp cannot live where the water gets so deep that sunlight does not reach their blades (leaves). Without sunlight they cannot perform photosynthesis.

Kelps grow best in cold water, so they are found in great numbers only as far south as Point Conception on the Pacific Coast, and down to Cape Cod on the Atlantic. In these waters they form great "forests."

There is no mistaking a sea palm in the pile of debris. It looks like a tropical palm tree, except that it's only two feet tall. This seaweed grows far out on the rocks where the Pacific waves hit the hardest. When a wave hits, the sea palm bends back in the white foam. But its stipe (trunk) is tough, and it bounces right back again.

Most of the other seaweeds that live at the ocean's edge stand up only when covered with water. The water supports them just as it holds you up when you float. Some seaweeds have small balloons on their blades to give extra lift. These bladders are filled with gas made by the plant.

When the tide goes out these seaweeds fall over and lie limply on the rocks. Then life on the rocky shore slows down. Those seaweeds not in tide pools must be able to survive several hours of hot, drying sunshine. During this time many sea creatures, such as crabs and sea stars, stay wet and cool under the seaweed.

Sea lettuce looks good enough for a summer salad (illust.). It is one of a number of green seaweeds that grows best in places where the ocean is quieter and warmer. Some others look like long stringy hair, ribbons, or grass. They can be found in the upper tide pools along the rocky shores. Farther south and along the Gulf Coast they grow around breakwaters, docks and pilings. A common place to find them is on boat bottoms.

Seaweeds are an important part of the ocean community. Many kinds of sea creatures find shelter and food among them. For example, in the kelp "forests", small fish and shrimp hide from hungry predators within the tangled maze. Animals such as hydras, whelks and sea slugs live on the blades. Sea stars, clams, crabs and worms seek shelter among the twisting holdfasts. Most important, the seaweeds make oxygen and food for all the sea animals.

But now, piled up on the beach, the seaweeds are part of another community. As they begin to rot, they attract thousands of tiny shrimplike creatures called beach hoppers. The hoppers and small crabs feed on the dead plants. They in turn attract shorebirds who flip over pieces of seaweed, looking for them.

Seaweeds are important to man as well as to the ocean community. Several kinds are harvested. In the kelp "forests" the top few feet of the plants are cut off every so often. Seaweeds are processed into powder or liquid form and added to many paints, cosmetics, medicines and foods.

So now you can ask someone, "Have you eaten any seaweed today?" They will probably say, "No!" But they may be wrong!

STUDENT PAGE

USEFUL PLANTS OF THE SEA

NAME____DATE__________

DIRECTIONS: USE THE ARTICLE IN LOOKING UP CORRECT ANSWERS TO THESE QUESTIONS.

1. LIST FOUR (4) USES FOR SEAWEED IN YOUR HOME.

   1.____________________ 3.____________________

   2.____________________ 4.____________________

2. WHAT IS UNUSUAL ABOUT THE GIANT BLADDER KELP?

3. WHY WOULDN'T YOU FIND KELP NEAR FLORIDA?

4. HOW WOULD YOU RECOGNIZE A SEA PALM?

5. NAME TWO MEANS OF SUPPORT FOR SEA PLANTS.

   1.____________________ 2.____________________

6. NAME TWO WAYS THAT SEAWEEDS HELP SEA ANIMALS?

   1.____

   2.____

7. NAME THREE PARTS OF SEAWEEDS.

   1.________________ 2.________________ 3.________________

8. WHAT DANGERS ARE SEAWEEDS AND OTHER FORMS OF SEA LIFE FACING?

9. COMPLETE THESE SENTENCES:

______________________ IS THE PART OF THE KELP THAT SECURES (ATTACHES) TO ROCKS, ETC.

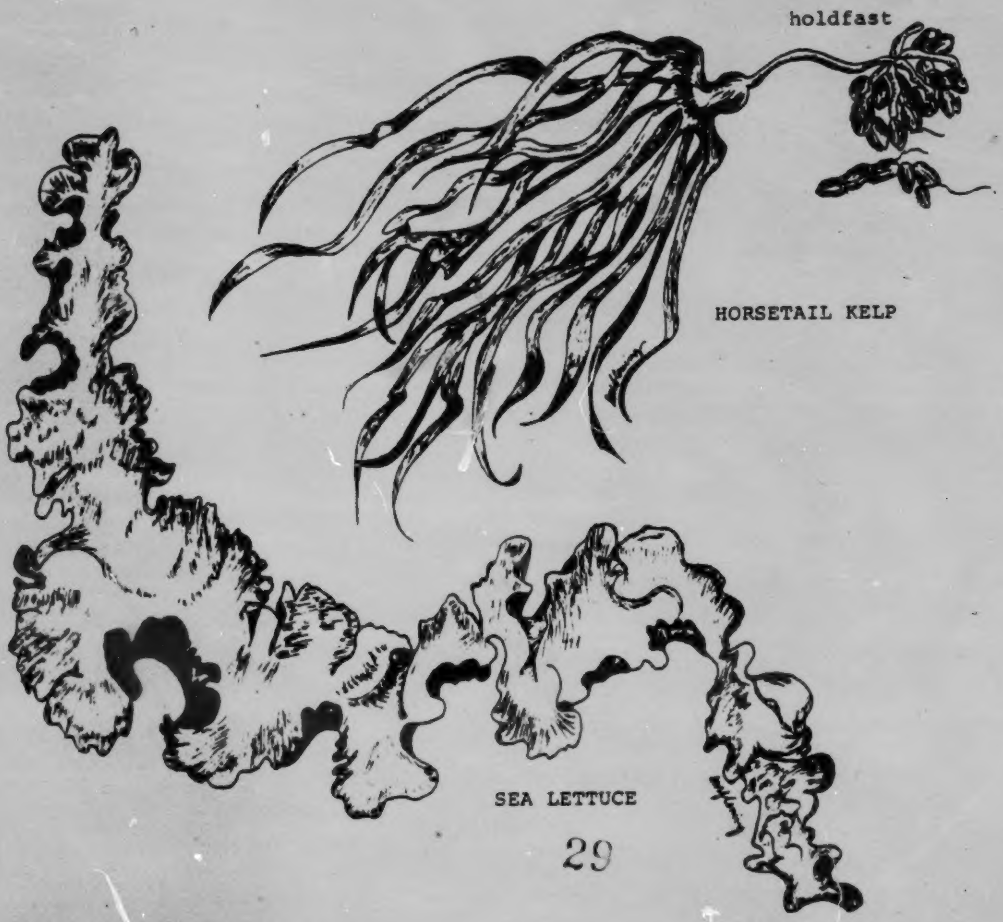
______________________ IS THE "TRUNK" OF SEAWEEDS.

_____ ________________ IS THE LEAF-LIKE PART OF SEAWEEDS.

______________________ ARE SACKS FILLED WITH GAS WHICH HOLD UP THE PLANTS.

______________________ ARE LEAKING POLLUTION INTO THE SEA AND SEAWEED IS BEING AFFECTED.

______________________ ARE ANIMALS THAT SWIM AROUND THROUGH SEAWEED LOOKING FOR OTHER ANIMALS TO EAT.



A City Jungle

Curriculum Topic
ECOLOGY - GEOGRAPHY

Environmental Topic
ECOSYSTEM - An ecosystem consists of all the plants and animals in a given area interacting with each other and their non-living environment.

Skills
Collecting, compiling and mapping data
Observing
Using a key

Subject
Social Studies

Grade Level(s)
3-5

Site
Classroom
Schoolgrounds

Author
Maryann Cronin Horgan

Objective

The students will be able to:

1. express and share their feelings about the city and their everyday environment,
2. observe living things in their school neighborhood,
3. identify and describe the interrelationships found in their urban neighborhood.

To The Teacher

Many city children know only the city. Smog, crowding, and traffic are a way of life. Conditioned by their concrete environment, these children feel little need for pastoral environments. Blaring radios, television, pop art and "happenings" are substituted for woodland solitude, scenic beauty and nature study. A city child is generally not conditioned to respect the delicate balance existing between the natural world and the city environment.

To sensitize the young urban child, ages 3-11, contact with living plants and animals can be meaningful. A walk around the schoolgrounds or the neighborhood may be planned by the students and teacher to investigate the many different ecosystems seen in vacant lots, parks, trees, schoolyards. The purpose of the walk is to observe plants and animals and to increase the students' awareness of the interrelationships and adaptations these living things have developed to cope with special city conditions. Many short walks may be planned to emphasize different skills and activities or to see seasonal changes.

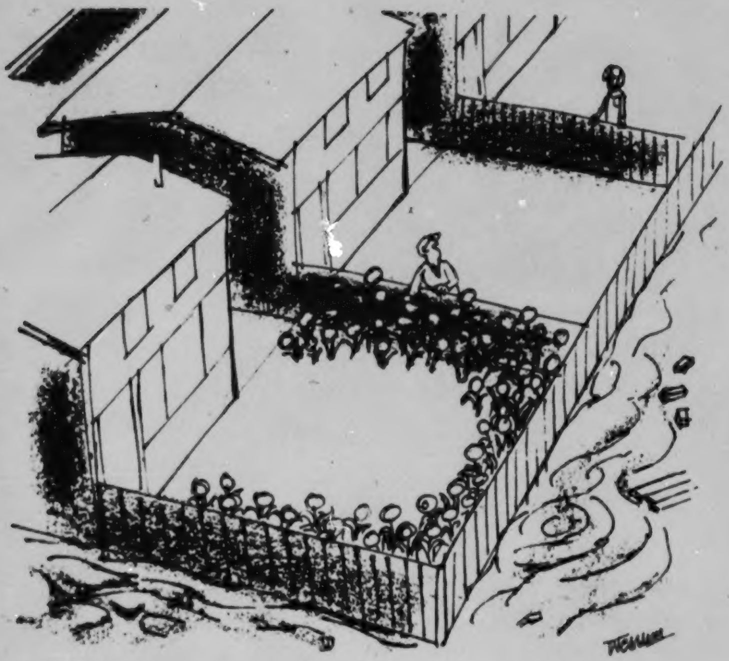
Before You Begin

Materials:

map-making materials (paper, crayons, rulers), identification books and keys, plant press, magnifying lenses, trowels, exercise worksheets (Safari Game, A City Is...)

Words To Know

community, survival, adaptation, food web, interrelationship, environment, urban, suburban, rural, ecosystem



"I told you--they're plastic!"

Conservation News 9-15-74

ACTIVITY

1. Students will complete the worksheet "A City Is..." (see student page). Later the answers may be shared and discussed.

2. Students will list familiar plants and animals expected to be found on a neighborhood walk; compile lists on chalkboard.

3. During a walk, small teams will use the "Safari Game" (see Student Page) to help improve their observation skills.

4. Back in class, the students may analyze their collected data by sharing their findings and participating in a teacher-supervised discussion. Sample discussion questions are:

   a) How do animals and plants survive in concrete cities?

   b) Why do birds visit or live in this neighborhood?

   c) What can we learn from these organisms relating to our survival in the cities?

   d) How do animals and plants contribute to our community?

5. After another exploratory walk, students working in small teams will draw a map of the school grounds and/or the neighborhood. The teams will plot with a red dot all natural items and with a blue dot all human creations.

Related Activities

Students could plan a group or class project to reinforce their awareness of nature and its value to man in the city:

- create window boxes for school windows
- plant shrubs, trees or flowers around the school
- construct animal feeding stations outside classroom windows
- erect bird houses or bird baths
- survey neighborhood people for improvement ideas (shade tree needed near bus stop, park in vacant lot, etc.)
- teams may take a sample survey of plants and animals
- individuals may use keys or identification books to name things
- class may take a sample of a leaf or common wildflower to press for class display

Resources

Dumer, M.B., "Introduction to the Urban Environment," Madison County ESEA Title III Project, Environmental Education Center, North Carolina EEC #223 (student pages)

It's Your Environment, ed. Sherry Koehler, Charles Scribner's Sons, New York , 1976 EEC #818 (easy reading and good activities)

Schneider, G., "Conservation Teaching in the City," The Conservationist, New York, 1968

"Nature in the City," ECO-NEWS, Environmental Action Coalition, New York, 1974

"Vacant Lot Studies," National Wildlife Federation, 1971 EEC #24

STUDENT PAGE

A CITY IS...

1. A PLACE WHERE

2. BUILDINGS IN WHICH

3. PEOPLE WHO

4. NOISES LIKE

5. PARKS WHERE

6. A VACANT LOT WHERE

7. ANIMAL LIFE IS OFTEN HIDDEN, BUT

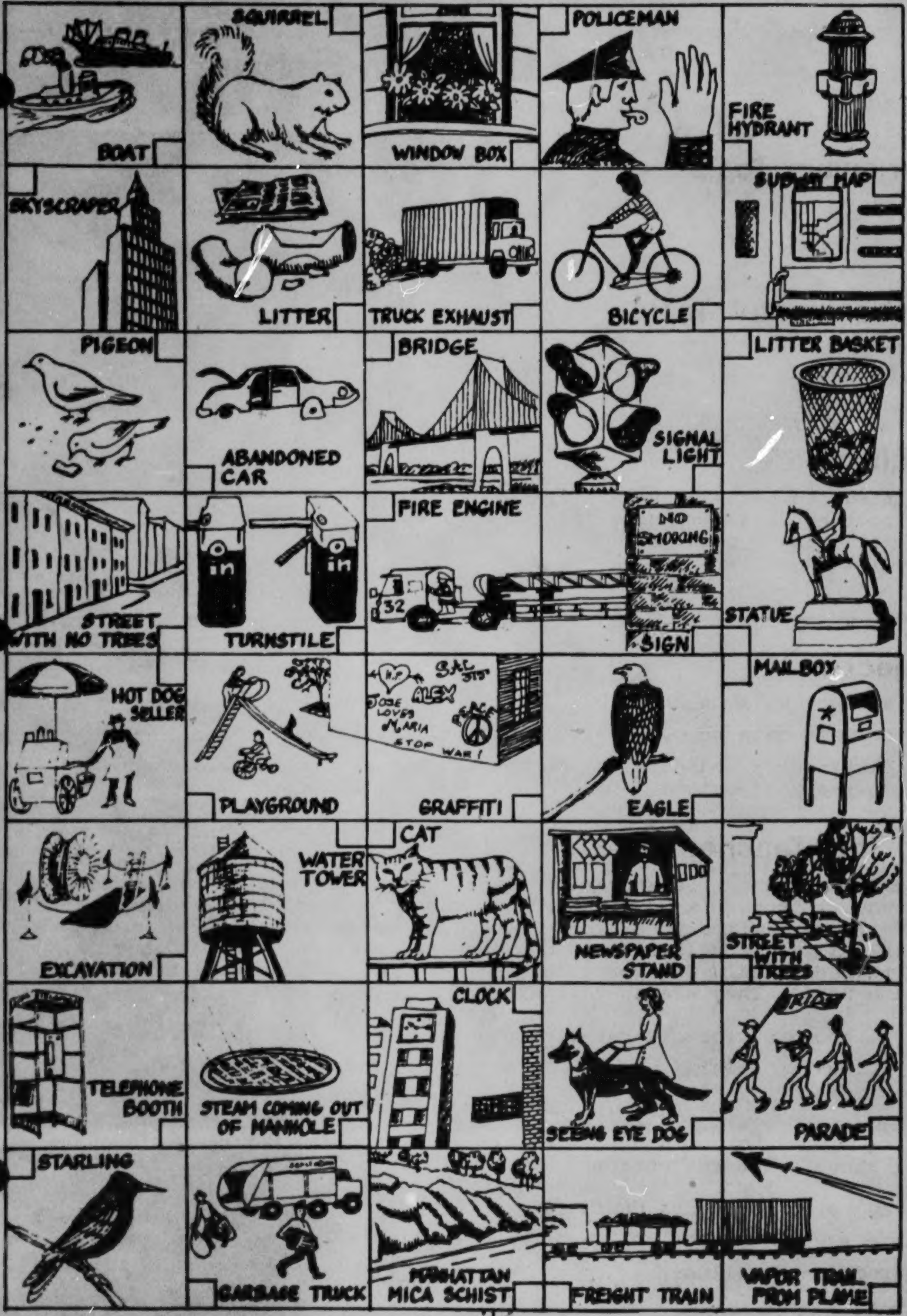
8. SPECIAL PLANTS SUCH AS

9. EXCITING TO SOME PEOPLE BECAUSE

10. IRRITATING TO SOME PEOPLE BECAUSE

SAFARI GAME

ON YOUR TRIP CHECK ☑ ALL THE THINGS THAT YOU SEE


☐ BOAT
☐ SQUIRREL
☐ WINDOW BOX
☐ POLICEMAN
☐ FIRE HYDRANT
☐ SKYSCRAPER
☐ LITTER
☐ TRUCK EXHAUST
☐ BICYCLE
☐ SUBWAY MAP
☐ PIGEON
☐ ABANDONED CAR
☐ BRIDGE
☐ SIGNAL LIGHT
☐ LITTER BASKET
☐ STREET WITH NO TREES
in
in
☐ TURNSTILE
☐ FIRE ENGINE
32
NO SMOKING
☐ SIGN
☐ STATUE
☐ HOT DOG SELLER
☐ PLAYGROUND
H.P.
SAL 315
ALEX
JOSE LOVES MARIA
PEACE
STOP WAR!
☐ GRAFFITI
☐ EAGLE
☐ MAILBOX
☐ EXCAVATION
☐ WATER TOWER
☐ CAT
☐ NEWSPAPER STAND
☐ STREET WITH TREES
☐ TELEPHONE BOOTH
☐ STEAM COMING OUT OF MANHOLE
☐ CLOCK
☐ SEEING EYE DOG
☐ PARADE
☐ STARLING
☐ GARBAGE TRUCK
☐ MANHATTAN MICA SCHIST
☐ FREIGHT TRAIN
☐ VAPOR TRAIL FROM PLANE

Pond Bottom Study

Curriculum Topic
BIOLOGY

Environmental Topic
ECOSYSTEMS

Skills
Writing, comparing, analyzing, collecting data, graphing data, constructing hypothesis, predicting

Subject
Math, Science

Grade Level(s)
3 - 5

Site
Pond edge

Author
Karen Ann Hayward

Objective

The student will be able to:

1. collect data on pond bottom in tabular form,
2. distinguish and name common aquatic plants and animals found in and on the pond bottom.

To The Teacher

A pond environment is extremely diverse. The approaches that a teacher can use to present this aquatic environment are equally diverse. This activity is limited to a biotic study (living component) as opposed to an abiotic (non-living) of one specific habitat, the pond bottom. The teacher should be aware, however, of the other general habitats of the pond. They are as follows:

1. pond surface (water-air interface)
2. water column
3. air above pond
4. edge of pond
5. pond bottom

During a pond bottom study, students sample in the bottom surface and just above or on the bottom.

On the bottom students could find:

rotifers
hydras
leeches
beetle larvea
crustaceans
nemarodes
molluscs

In the bottom students could find:

molluscs magflies dragonflies
worms midges

In Part 9 of the Activity section, students are asked several questions. There are no set answers because the results of this activity will always be different depending on the quality of the pond, the time of year, and many other variables that can affect a habitat. Students are then asked to hypothesize the reasons for their results. Examples could be:

a. this is a polluted pond, so life here is limited in number and diversity. (vice-versa could also be true)

b. the time of year is wrong for abundant life.

c. the bottom is rocky and animals prefer a more silty substrate.

Before You Begin

Materials: one Data Sheet for each student (to be duplicated by the teacher before class) See Table 1

one piece of 8" x 10" cardboard for each student

tape or glue, pencil, 10" piece of string for each student, whistle (one for each teacher), meter stick, 1/2 of a quart size milk or orange juice paper container cut length wise top to bottom for each student, rake or clam hooks, shovel, buckets, several Golden Guide Pondlife (a good and simple key - see Resources for reference)

Possible extras: screening to place over a bucket or pan so that students can better sift through bottom sediments

Words To Know

biotic-living; abiotic-non-living; benthon-organisms resting on bottom or burrowing into bottom; habitat-the place or site where a plant or animal naturally or normally lives and grows; census-a count diversity-many different types

ACTIVITY

In class:

1. Have each student glue their copy of the data sheet, which the instructor has dittoed, on a piece of cardboard. (See Table 1)

2. Have each student tie a pencil to their cardboard with a piece of string.

Outside class:

1. Assemble the class outside with their data board and pencils. Divide the class in half. One group to study on the bottom; the other in the bottom.

2. Explain rules of behavior and safety, for example:
   - a. No running, shouting
   - b. When the whistle blows all action and talking stops and students are to give their attention to the teacher.

3. The teacher should have:
   - a. a metal garden rake or clam hook
   - b. a shovel

4. Measure one meter square from the pond's edge out. Place large rocks or sticks at each corner of the meter.

5. The teacher should take the rake and gently remove all plants and animals directly above the pond's bottom. Place these plants into a bucket to be distributed among the containers of Group I students. Have the students examine their sample closely.

6. After students have examined their plants and animals, ask them to identify as many plants or animals as they can using The Golden Guide to Pond Life or similar guide book. Student should record the name of each plant as well as the number. Allow adequate time.

7. With the shovel, the teacher should remove one inch of sediment and place it into a bucket or directly into the student containers in Group II. Allow a few minutes for the suspended sediment to settle out. Students should see a great deal of movement now.

8. Have Group II students follow the same format as Group I. Identify the organisms and count their number. Have students record their observations on the data sheet.

9. Assemble the group in the classroom. Make one data table on the board using the whole classes' data sheet. Discuss the results.

10. Ask the student the following questions:
    - a. Where did they find the highest number of plants? Of animals? (in or on the bottom)
    - b. Where did they find that they had more different types of plants and animals? (diversity) Not the highest numbers but different types of plants and animals.
    - c. Ask the students to hypothesize their results.

Related Activities

1. The ideal follow up would be for the student to continue to study the pond environment but each time selecting a new habitat such as pond surface, water column, air above the pond and the edge of the pond.

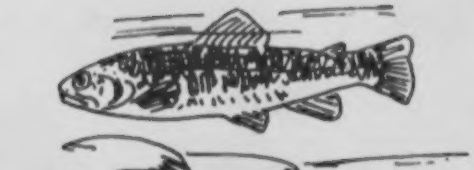
Resources

Andrews, William A., A Guide to the Study of Freshwater Ecology, Prentice-Hall, Inc., 1972, pp. 125-127.

Klots, Elsie B., The New Field Book of Freshwater Life, G.P. Putnam's Sons, 1966. pp. 30-33.

Ried, George K., Ph.D., A Golden Guide Pond Life, Golden Press, 1967 pp. 18-21.

Notes To Myself



STUDENT PAGE

BOTTOM SURFACE
(ON THE BOTTOM)

PLANT'S NAME	NUMBER	ANIMAL'S NAME	NUMBER
TOTAL PLANTS		TOTAL ANIMALS	
TOTAL DIFFERENT KINDS OF PLANTS (DIVERSITY)		TOTAL DIFFERENT KINDS OF ANIMALS (DIVERSITY)	

BOTTOM SEDIMENT
(IN THE BOTTOM)

PLANT'S NAME	NUMBER	ANIMAL'S NAME	NUMBER
1.			
2.			
3.			
4.			
* 5.			
TOTAL PLANTS	NUMBER	TOTAL ANIMALS	NUMBER
TOATL DIFFERENT KINDS OF PLANTS (DIVERSITY)		TOTAL DIFFERENT KINDS OF ANIMALS (DIVERSITY)	

* HINT: IT WOULD BE THE NUMBER IN THIS COLUMN.

Niche Switch

Curriculum Topic

BIOLOGY, ECOLOGY, ENDANGERED SPECIES

Environmental Topic

ECOSYSTEMS

Skills

Collecting and compiling data,
inferring from data,
interpreting data

Subject

Science, Social Studies

Grade Level(s)

5 - 8

Site

Classroom

Author

Karen Hayward
William McCann

Objective

The student will be able to:

1. identify the different components of each niche studied,
2. list the different requirements of the animals who inhabit these niches.

To The Teacher

The actual location where an animal lives and performs certain functions is called its habitat. The combination of functions and habitat is this animal's ecological niche. The term niche refers to the animal's total role within a biological community, whereas the term habitat only refers to a specific location.

The concept of "Niche" is sometimes difficult to illustrate to a student. By centering an activity around an actual example of a niche, the students will be able to relate and obtain a more thorough understanding of what an ecological niche is, and how specific and important it is. The easiest way to differentiate habitat and niche is to think of the habitat as the address of the animal and the niche as its occupation.

The students will select two different animals. Each animal will be analyzed, a list of characteristics of that particular niche will be enumerated and the ecological role will be evaluated.

Note: This activity infuses nicely when students are studying World Geography and the different human niches throughout the world.

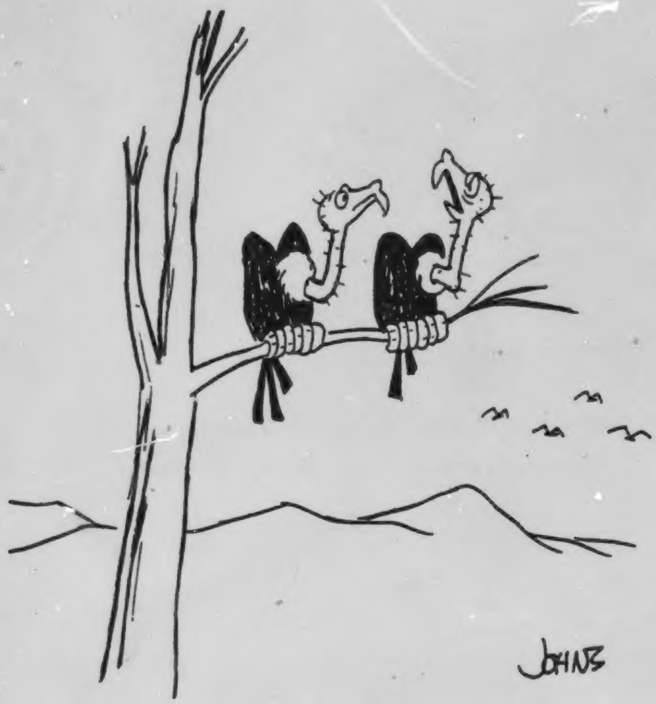
Before You Begin

Preparation: A discussion of different human environments throughout the world might precede this activity.

Materials: Students will need paper and pencils.

Words To Know

niche, habitat



"AND STOP USING THE TERM 'SCAVENGER'! WE'RE 'ANTI-POLLUTANT ENVIRONMENTAL CONTROLLERS'!"

Conservation News 8-1-76

ACTIVITY

1. Explain what a niche is to the students.
2. Have the students brainstorm different animals and their niches.
3. Write these animals and niches on the blackboard.
4. Have each student select two animals and their niches.
5. Have students describe each animal's niche on a sheet of paper at his or her desk. Please see Table I for an example:

	Monkey	Kangaroo Rat
Habitat	Tropical Forest	Desert
Food	Vegetarian (a tropical forest has a lot of plants)	Omnivorous (eating all kinds of foods--this is helpful because food is scarce in a desert)
Transportation	Aerial Climber	Sand and Tunnel Traveler
Specialities		Very efficient kidneys so it never has to drink water

6. Ask each student to have their animals switch niches. Can the animal survive in its new niche? What are its problems? Why? Have the students write their answers underneath their list.

7. Have students discuss the problems. Write these on their paper. Example: a frog may be able to live in a fish's environment, yet fish cannot live in all of a frog's environment.

8. Each student should have the opportunity to explain what niches they have worked with and their conclusions.

9. How has one adapted to succeed over his competitors?

10. Show why niches are specific to certain animals. Relate,food chains, food capture processes, locomotion, defense, and morphological differences.

Related Activities

Discuss the fact that many niches left by extinct animals remain unfilled. Provide resource books and encourage students to make a list of extinct species.

Tree Treasure Hunt

Curriculum Topic
BIOLOGY - PLANTS

Environmental Topic
ECOSYSTEMS

Skills
Collecting data
Classifying

Subject
Science

Grade Level(s)
4 - 8

Site
Wooded area

Author
Ed Lisk

Objective

The student will be able to identify and classify some of the trees observed during the exercise.

To The Teacher

"The woods are lovely, dark and deep," wrote poet Robert Frost, and unknowingly, he pronounced one of the keys to forest ecology. For the organization and history of forest communities is intimately bound up with the availability of light.

The forest is structured in successive horizontal layers. At the top is the canopy, the layer formed by the leaves and/or needles of the tallest trees. Beneath this is the understory, a region of smaller trees and saplings of canopy species. The third stratum is composed of woody bushes, below which is an herb layer of non-woody plants, including both flowering plants and ferns and mosses. Finally, at the bottom of the forest is the soil, with its own plant and animal life. This structure is primarily determined by light - the understory and herb layer species are generally those which are tolerant to shading. They will often leaf out early to use the light available when the canopy trees (in deciduous forests) are still bare. Many of these small plants which are wind-pollinated, flower even before leafing, which avoids the restricted air flow in the woods once a full canopy of leaves is present.

The trees in the understory are maids-in-waiting. If lightning, old age, disease, or a buzz saw fells a tree in the canopy, these understory trees, nourished by the sudden appearance of light reach skyward. The rapid growth literally is a race for the top, for whichever tree or trees fill the gap in the canopy will reach full maturity; those in the shade below will never get the chance. The cumulative effect of these changes in the canopy over time is called succession. Tree species which can survive under low light intensity replace species which grow very well when there is plenty of light but poorly in the shade. In the understory, the former species out-compete the latter and so are ready to take over when gaps occur in the canopy. In northeastern United States, a typical succession pattern is from bare field (typified by crabgrass, horseweed) to grassland (aster) to grass-shrub (broomsedge) to coniferous forest (pine with hardwood understory) to hardwood forest (oak and hickory) over a period of about one hundred fifty years.

The oak-hickory forest is commonly referred to as a "climax" because if left undisturbed (by fire, hurrican, man, etc.) it is much more stable and slower to change than other communities. But even the climax forest is not static nor homogenous. The forest is patchy and composed of a diversity of plant species. This diversity creates a wide variety of micro-habitats for animals and encourages the stability that is characteristic of forest ecosystems. This activity should make students aware that although we speak of forest communities characterized by one or two dominant species, the forest is in fact a complex assembly of many different plant and animal species.

Use the treasure hunt in this activity as practice or an introduction to collecting and identifying shrub and tree types. In order to use classification techniques it is valuable for students to sharpen observational powers, collecting skills, organizational and field techniques, and ability to describe and differentiate among natural objects.

Before You Begin

1. Duplicate worksheets.
2. Select an appropriate wooded site.
3. Assemble collecting bags for each student or group of students and labels for marking collected items.

Words To Know

alternate, opposite, diversity, shrub, tree, lobes, compound leaf, pith, wintergreen, pitch, cone, walls

ACTIVITY

1. Choose an appropriate wooded site.

2. Assemble class outside.

3. Distribute worksheets.

4. Explain that the task is to find as many natural objects as possible that fit the clues on the worksheet.

5. Advise students that samples should be only large enough to show characteristic. Samples from the ground are much better than from a live tree. Be careful of poisonous plants (e.g., poison ivy).

6. "Write abouts" are to be described or located rather than sampled.

Related Activities

1. Have students become familiar with dichotomous identification key for trees and shrubs and identify local trees and shrubs.

2. Have student relate amount of sun and soil types to where they found specific plants.

3. Explore the commercial aspects of trees and wood.

Resources

Braun, E. Lucy, Deciduous Forests of Eastern North America, Blakiston Co., 1950.

Brockman, Frank C., A Guide to Field Identification Trees of North America, Golden Press, 1968 EEC #C106.

McCue, G., The Forests and Man, Benziger, Inc., 1971, EEC #B146.

Watts, May Theilgaard, Master Tree Finder, Nature Study Guild, 1963.

Credit

Ecology Treasure Hunt, Project I-C-E, Green Bay Wisconsin, EEC #607.1, 607.2.

Steve Gold, contributor

Notes To Myself

STUDENT PAGE

DIRECTIONS: IN A WOODY AREA, FIND AS MANY ITEMS THAT MATCH THE FOLLOWING CLUES. BE SURE TO LABEL ALL SPECIMENS FOUND BEFORE PLACING THEM IN YOUR COLLECTING BAG SO LATER THEY WILL BE EASIER TO IDENTIFY. YOU MAY NOT BE ABLE TO FIND OBJECTS TO MATCH EVERY CLUE.

CLUES

BRING BACKS:

1. ______ A TWIG WITH OPPOSITE BRANCHES.
2. ______ A TWIG WITH ALTERNATE BRANCHES.
3. ______ A LEAF WITH MANY SMALL SAW TEETH.
4. ______ A LEAF WITHOUT ANY TEETH.
5. ______ A LEAF THAT IS VERY LONG AND NARROW BUT FLAT.
6. ______ A LEAF THAT IS ALMOST ROUND.
7. ______ A LEAF WHICH HAS SHARP LOBES.
8. ______ A LEAF WHICH HAS ROUNDED LOBES.
9. ______ A LONG NEEDLE LEAF THAT GROWS IN A BUNDLE OF FIVE.
10. ______ A LONG NEEDLE LEAF THAT GROWS IN A BUNDLE OF TWO.
11. ______ A SHORT NEEDLE LEAF THAT GROWS IN A BUNDLE OF TWO.
12. ______ A NEEDLE CLUSTER OF 12-25 ALL GROWING FROM ONE BUNDLE OR BASE.
13. ______ A NEEDLE THAT GROWS WITHOUT BUNDLES AND IS FLAT.
14. ______ A NEEDLE THAT GROWS WITHOUT BUNDLES AND ROLLS IN YOUR HAND.
15. ______ A TWIG OF TINY OVERLAPPING SCALE-LIKE LEAVES.
16. ______ A FLAT LEAF THAT IS LARGE AND HEART-SHAPED.
17. ______ A LEAF THAT IS A COLLECTION OF MANY SMALL LEAFLETS (COMPOUND LEAF).
18. ______ A LEAF STEM WHICH IS FLAT.
19. ______ A TWIG WHICH HAS PARTITIONS IN THE PITH WHEN CUT WITH A KNIFE.
20. ______ A TWIG WHICH TASTES LIKE WINTERGREEN.
21. ______ A CLUSTER OF RED FUZZY FRUIT FROM THE TOP OF A SHRUB WITH FURRY TWIGS.
22. ______ A TWIG WITH SMALL THORNS.
23. ______ A TWIG WITH VERY LONG SHARP THORNS.
24. ______ A BIT OF WHITE PAPERY BARK (DO NOT CUT THE BARK TO GET IT).
25. ______ A BIT OF GREY-YELLOW PAPERY BARK (DO NOT CUT THE BARK TO GET IT).
26. ______ AN ACORN OR ACORN FRAGMENT.
27. ______ A TREE SEED WITH A WING THAT IS LONG.

STUDENT PAGE, CONT'D.

28. ______ A TREE SEED WITH A FLAT WING AROUND THE SEED.
29. ______ A TREE SEED LIKE COTTON DOWN OR DANDELION.
30. ______ A LONG FLEXIBLE CONE.
31. ______ A STUBBY, TOUGH CONE.
32. ______ A SMALL, SOFT CONE.
33. ______ A CONE-LIKE FRUIT ON A BROADLEAF SHRUB.
34. ______ A LONG HANGING "FLOWER" FROM A SHRUB OR TREE.
35. ______ A LEAF WITH VEINS ALL COMING FROM A LONG MID VEIN.
36. ______ A LEAF WITH VEINS COMING OUT MAINLY FROM THE BASE.
37. ______ A LEAF WITH A FEW LARGE TEETH BUT NOT LOBED.
38. ______ A LEAF WITH TEETH WHICH ALSO HAVE TEETH.
39. ______ A TWIG WITH CORKY WINGS.
40. ______ A TWIG WITH THIN WOODY WALLS AND MUCH PITCH INSIDE.
41. ______ A LEAF WITH LOBES WHICH ARE VERY DEEP.
42. ______ A LEAF WITH LOBES WHICH ARE VERY SHALLOW.

DIRECTIONS: IN THE NEXT SECTION, DESCRIBE THE LOCATION OR EXPLAIN THE OBJECT WHICH MATCHES THE CLUE. DO NOT BRING A SAMPLE OF THE OBJECT TO CLASS.

WRITE-ABOUTS:

1. A SMOOTH GREY BARK ______________________________
2. A SMOOTH BARK WITH STICKY PITCH BLISTERS ______________________________
3. A SMOOTH YELLOW TO WHITISH BARK ______________________________
4. A FAIRLY SMOOTH, SHINY BLACK BARK ______________________________
5. A THICK RIDGED BARK ______________________________
6. A GREY THINNER BARK OF FLAT, SQUARISH OR OBLONG PLATES ______________________________
7. A BARK WITH LONG SHAGGY GREY PARTS BEGINNING TO FALL OFF ______________________________
8. A TREE WITH VERY FRAGRANT FLOWERS ______________________________
9. A TREE WITH A RICH PINEY SMELL ______________________________

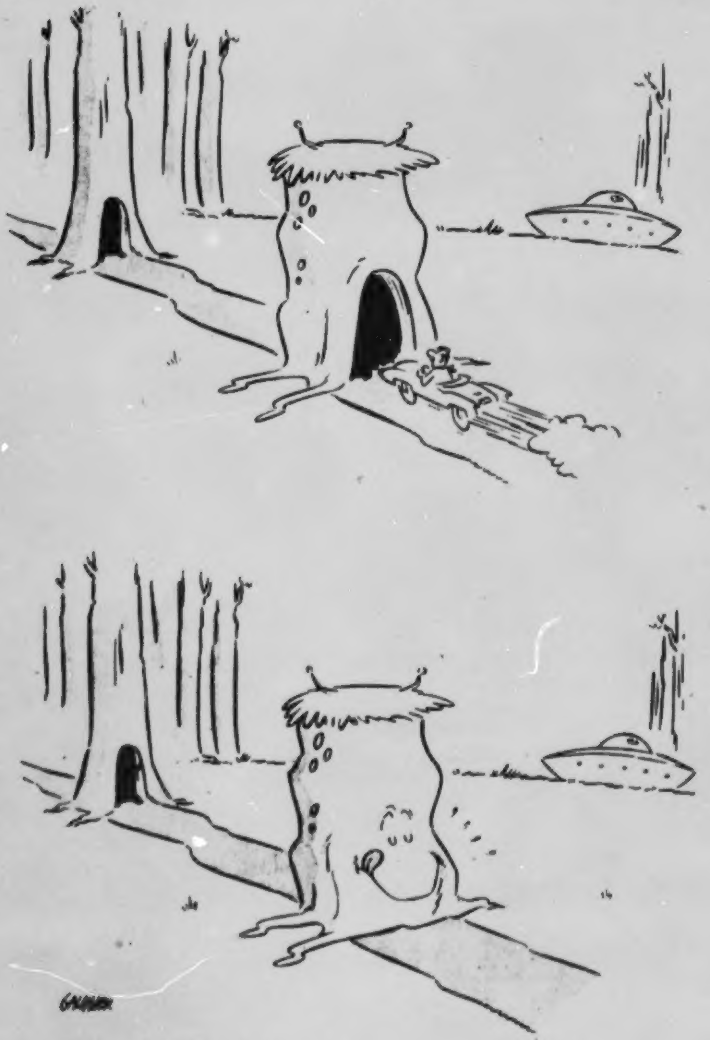
STUDENT PAGE, CONT'D.

10. A TREE THAT GROWS DOWN IN WET, SWAMPY GROUND ______________________

11. A TREE WITH BARK THAT IS IN LAYERS OF BROWN AND WHITE OR BLACK AND WHITE ______________________

12. A TREE WHICH HAS SMALL CHERRY-LIKE FRUITS WITH STONY PITS ______________________

GOOD LUCK!



Conservation News

Construction Engineers

Curriculum Topic

BIOLOGY

Subject

Science

Environmental Topic

ECOSYSTEMS

Grade Level(s)

4-6

Site

Outdoors

Skills

Compiling, organizing and interpreting data

Author

Janet Costa

Objective

By classifying the materials used in the construction of a bird's nest, students will be able to:

1. distinguish between resources provided by nature and materials created by human civilization
2. organize data and analyze the co-existence of birds and humans
3. infer the meaning of ecosystem

To The Teacher

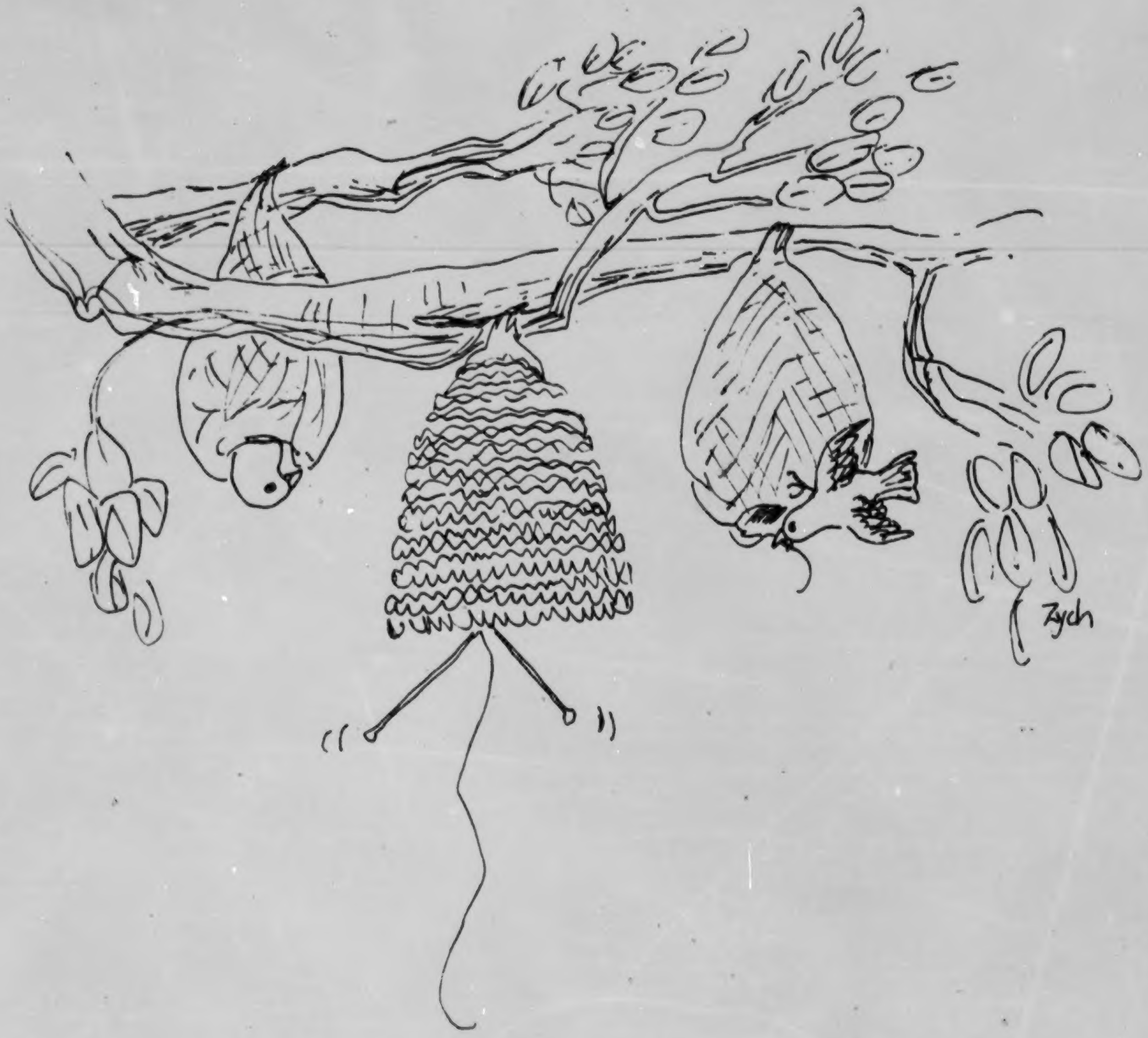
People's encounters with wildlife are frequently antagonistic. Even indirectly, humankind threatens species with extinction. In fact, the primary cause of extinction in the next few decades is likely to be destruction of habitat rather than outright slaughter of populations.

Not all human activities, however, need be destructive of natural habitat. The human environment may be structured to provide living conditions for species resourceful enough to adapt to different milieus. Birds, for example, not only nest in human-made environments, but often use products of our throw-away society to construct their nests.

Before You Begin

Materials: tweezers, abandoned bird's nest(s)(the more the merrier!) Label each to indicate the location from which it is being taken.

Caution: The best time to find abandoned nests is in the fall. Look in woods, parks, backyards, and vacant lots - even under the eaves of porches! Be certain the nest is abandoned before removing it.



ACTIVITY

1. Organize students into groups. Give each group a nest and a pair of tweezers (preferably one pair per student).

2. Instruct your students to use their tweezers to carefully separate materials used in the construction of the nest. As they separate, ask students to divide the various materials, and organize them according to type (sticks, grasses, string, wire, etc.).

3. Discuss the distinction between natural resources and matter created by human production. Illustrate this distinction with material from the birds' nests. Ask the students to distinguish these two types for themselves by gathering the materials they have separated from the nest into two piles.

4. Discussion:

   a. Can you tell what each material is?

   b. Can you think of substitute materials?

   c. Where was the nest found? (Visit the spot, if you can.) From where might the bird have acquired each different type of material? Why, in some instances, were materials made by humans used? Were comparable natural resources available?

   d. Has human civilization helped the bird? How has the bird adjusted to our presence?

Related Activities

1. Consider other ways in which humans aid birds (a. by providing nest sites: birdhouses, street lamps, air conditioners, other odd places; b. by feeding them during the winter months.)

2. Consider what would happen if we didn't have birds or if, on the other hand, birds didn't have us. Who would be harmed most by the other's disappearance?

Resources

Musselmann, V. "Constructon Engineers", Learning About Nature Through Games; Stackpole, 1975

Credit

Steve Gold, Patricia Marshall, contributors.

Drawing: Cecelia Zych

Decomposing Log

Curriculum Topic

BIOLOGY

Environmental Topic

ECOSYSTEMS

Skills

Analyzing
Locating and obtaining information
Organizing information
Evaluation of information

Subject

Science

Grade Level(s)

3-5

Site

woodlot

Author

Karen Hayward

Objective

The student will be able to:

1. classify certain organisms
2. explain metamorphosis of insects
3. explain the value of decomposition

To The Teacher

Every living thing dies and leaves its remains. Living things produce waste products. Dead bodies and waste products piled up would mean a large pile of garbage in nature. Nature has both plant and animal garbagemen. We call the garbagemen of nature decomposers because they break down and recycle the garbage.

Nature's garbage contains many good things which must be returned to the soil or other plants and animals cannot grow. The decomposers help minerals from the garbage go back to the soil. The slowly decaying parts of wood are taken into the soil to hold water and minerals for plant growth. Hole making animals of the soil help air to go into the roots, and water to sink into the soil when it rains.

Many different animals work together to do the job of cleaning up nature's garbage pile. If there is a lot of garbage and enough water and good temperature, you can find many of these animals. We call a group of different animals and plants living and working together a community. Investigate a community of decomposer animals and watch how they work together to recycle the waste. See how they get needed minerals back to where nature can use them again. Find out how decomposer animals are part of a number of communities and the environment around them. See what conditions help communitites live. We call the combination of communities and environment an ecosystem.

A log contains a community of diverse organisms. The plants and animals act as decomposers, returning the nutrients from the log to the soil, which is thus enriched. There are two phases to decomposition - mechanical (breaking into small pieces) and chemical. But man frequently changes the rate of natural processes and therefore alters an ecosystem.

Before You Begin

The students will need:

forceps, glass dishes, newspaper

Words To Know

decomposition, diversity, decomposers, community

Conservation News 6-1-75

ACTIVITY

Field

1. Explore a local woodlot to find a moist, rotting log about two feet in length.

2. Have each student make observations on the log. Consider the following:

Condition of the bark on the log. It may be missing.
Evidence of plant growth on the log; for example, fungi (mushrooms), algae, mosses, young bushes, and trees.
Evidence of animal activity on or around the log. The log may have insect holes, ants, woodpecker holes, animal dens, and the like. Some of these may have caused the tree's death.
Examples of animals or plants inside the log. Tear a portion of the log apart only as a last resort. Respect the animals' homes inside. They are there for a reason.
Sawdust around the base of the log as an indication of its breakdown by insects and small mammals.
The kind (species) of tree, what its age might have been when its death occurred, and possible reasons it died.

3. Wrap the log in newspapers to prevent loss of animals. (You might also want to collect soil from beneath the log to study the organisms living there. Mealworms can be found in this habitat during the warm months.)

In class

4. Divide the students into groups of four or five.

5. Each group should move their desks together.

6. Students should observe the following:

   a. Plants such as fungi, lichens, and mosses, growing on the rotting wood. (chemical decomposition)

   b. Evidence of animals, including surface tunnels, droppings, cast animal skins, and others. (mechanical decomposition)

7. After these observations have been made, the pupils may gently break apart their pieces of the log. They should try to collect any organisms seen, and place them in covered dishes.

8. Drawings of any of the plants or animals found may be made as the log dissections are completed.

9. The organisms found may be classified into groups; e.g. insects, worms, crustaceans, spiders, and mollusks. For each group, determine how many different kinds of organisms the students have collected and how many individuals of each kind were found.

10. Determine the total number of organisms found. The larvae may be kept in a terrarium with portions of the wood until they mature.

11. Discussion Questions:

a. Ask the students to describe the interactions they have observed between rotting logs and nearby plant and animal populations. Then discuss with your students the benefits of the rotting log to the forest community. Examples of its value include:
Nutrients in the log are returning to the soil to be used by living plants. The log is providing homes for various mammals, insects, worms, and spiders. These small animals serve as food for larger predators (birds, fox, coyote, opposum, and snakes.) The rich, organic, loose material decaying from the log provides a unique habitat for certain plants - fungi, tree seedlings, wildflowers, mosses, and ferns.

b. Does a log possess a varied community?

c. Estimate how long it would require for the log to decompose naturally.

d. How long has it taken the class to mechanically decompose the log?

e. In what other ways does man affect the rate of natural processes?

f. How shall we dispose of the pieces of the log that are now left? Suggest that the class return the decomposed pieces along with any living organisms to the location where the log was removed. Explain that returning the pieces of the log to the woods will enrich the soil.

Related Activities

Have the students brainstrom a list of man-made materials.

Example: plastic, styrofoam, nylon, aluminum cans, tin, glass

Ask the students if any of these materials go through a cycle of decomposition similar to that of the log.

Resources

Leskowitz, Irving, ed., Teacher's Guide for Environmental Education, (Communities), The Center for Environmental Education, 1971

Credit

"Fallen Log", Activity #6, Project Learning Tree, American Forest Institute, 1977.

Building an Indoor Freshwater Pond

Curriculum Topic

BIOLOGY

Environmental Topic

ECOSYSTEMS

Skills

Acquiring information
Evaluating information
Constructing models
Observing

Subject

Science

Grade Level(s)

4 - 5

Site

Local pond, a ditch or a big puddle, stream, swamp, fresh water wetland, classroom

Author

Paul Sanderson

Objective

The student will be able to:

1. participate in the construction of a model pond,
2. name three organic and three inorganic components that make up a pond ecosystem,
3. identify four interactions and changes which occur within a pond ecosystem.

To The Teacher

An ecosystem consists of all the plants and animals in a given area interacting with each other and their environment. A pond offers students a first hand example of how an ecosystem works. Children seem to be fascinated by the frogs, frogs' eggs, fish, water insects, turtles, plants and flowers found in a pond. Unfortunately, a pond is not always accessible to your class. This activity will enable your class to benefit from and enjoy many of the aspects of a freshwater pond with only a few (perhaps no) trips out of the classroom.

Reid and Zim describe a pond as a "quiet body of water so shallow that rooted plants grow completely across it. Its water temperature is fairly uniform from top to bottom and tends to change little with the air temperature. There is little wave action, and the bottom is usually covered with mud. Typically, plants grow all along the shore. The amount of disolved oxygen may vary greatly in a 24-period."

Teachers should become familiar with: 1) the plants, animals and minerals found in a pond, 2) how they live, grow and interact, and 3) the characteristics of pond water. The previously mentioned Reid and Zim book, Pond Life, is a good simple reference that can be read cover-to-cover or used as a field guide. It is pictorial and can be used by children. More information on pond make-up is found at the end of this activity.

Before You Begin

MATERIALS:

1. The pond can be a small, shallow wading pool. The dimensions should be 4-5 feet in diameter, 1-2 feet in depth. These figures are arbitrary. A pool of this sort should be water tight, sturdy and clean. Borrow one from a friend or purchase one inexpensively at a local discount store.

2. A large plastic sheet should be placed under the pond, with the edges extending several feet out from it in all directions. This is used to catch splashed water, dropped tadpoles, etc.

3. A medium sized aquarium air pump is needed to maintain a decent O_2 level. These pumps seem to be found in many classrooms. They may be borrowed or purchased.

4. Locate a place in your classroom that is sunny. (You might use a grow light as a light source alternative). Water plants need sunlight.

5. The location of the pond within the classroom might also be determined by one of several variables:

   a) space - the floor seems logical, but a large table might work. Remember, H_2O is heavy.

   b) temperature- should be fairly constant, and relatively warm (50 - 70 degrees F). Warm temperature encourages growth.

   c) accessibility- the pond should be set up so it can be seen from as many sides as possible. A book shelf or screen might separate it from the class so it will not be too distracting. Also, keep it out of the way of pedestrian traffic.

6. Other useful items include: buckets, bottles and containers for carrying water, plants, animals, rocks, mud, field guides, pictures and books describing and illustrating pond life, hand lenses.

7. Note: This activity can be done anytime during the year, but springtime offers the greater possibilities of seeing new growth of animals, insects and plants. This activity will take several days to set up, but it needs periodic observation in order to enjoy it and make the most educational use of it. Some species may not flourish or may need replacing. Experiment and change the pond's population. The pond and its associated activities can last for months.

Words To Know

ecosystem, habitat, carnivore, herbivore, omnivore, minerals, pond, observe, larvae, organic, inorganic, photosynthesis, phototropism

ACTIVITY

1. Collect all the previously mentioned materials and make the preparations noted.

2. Collect pond life. This can be done in one of several ways:

a) Organize a field trip to a local pond. Take buckets and jugs (plastic). Collect as many plants (algae is necessary as food for many animals) as you can find. Remember the limited space of your pond, but get a variety. Collect animals: turtles, frogs, frogs' eggs, tadpoles, insects, nymphs, larvae, fish, crayfish, water bugs, flies, mosquitoes, snails, snakes, etc. Again, remember your pond size, and also be careful not to damage the ecology of the source pond. Collect pond water, as it contains minerals, as well as microscopic plants and animals. Take extra water as you will need to replace H_2O as it evaporates. Other sources of replacement water are wells, streams or even tap water if it is allowed to sit for a week to dechlorinate. Beware of polluted H_2O sources.

b) If you cannot make a field trip, or do not have a pond near your school, ask your students to bring in the above mentioned items as homework. Make sure to get a variety. Again, beware of polluted H_2O sources.

3. Begin to "assemble" your pond. Rooted plants can be anchored to the bottom with rocks. Add water, plants and animals slowly to avoid muddy water, damaging specimens and overcrowding. Try to make the pond look authentic. Don't fill the pool to the top, as water will splash out. Make several "banks" or shore areas for amphibians to stretch their legs. Do not forget the air pump. A length of plastic tube anchored under a rock seems to work well.

4. Watch the plants and animals for signs of stress. Try to get the students to determine why some species succeed, while others fail. Try to correct the situation if you wish. Make sure all animals have a source of food. Food suppliers may need to be added for some species.

5. After the pond has become established, discuss with your students some of these questions:

a) Why were plants and animals included? (O_2-CO_2 cycles, food chains and webs)

b) Who eats whom?

c) Discuss interdependence within the pond. (Many possible answers are carnivores, herbivores, omnivores).

d) Why was dirt or mud included? (Provides minerals for plants).

e) How do plants obtain food? (photosynthesis)

f) Can all the life in the pond be seen? (No, microscopic organisms exist).

g) What changes occurred in the pond? (Among the animals, eggs became tadpoles, then frogs; nymphs became dragon flies; and larvae grew into mosquitoes. Among plants, students will observe growth, flowering of marsh marigolds and lilies, and phototropism. Other changes are evaporation of water and dissolution of minerals.)

6. As animals and plants grow and mature, they should be released outdoors into a more suitable habitat.

Related Activities

1. Microscopes add a new dimension to pond study. Teach students how to use microscopes and to make slides of pond water, algae and small animals.

2. Discuss how the sun's energy, through photosynthesis, is the driving force behind pond life.

3. Experiment with variables, such as light, temperature and pH, and observe how they affect pond life.

4. Add man-made variables such as oil, soap and litter and observe the effects on the pond.

Resources

Reid, G. K. and H.S. Zim, A Golden Guide to Pond Life, Golden Press, 1967 EEC #C100 c. 3

Rodes, Nick and B.J. Amundson, "Knock the Four Walls Down...", P.A. Schiller and Associates, 1974 EEC #349B

"The Pond Activity Guide," Nashville Metro, EEC #553

Credit

Illustration, Ann-Marie M. Fleming

Notes To Myself

Closed Systems

Curriculum Topic

BIOLOGY

Environmental Topic

ECOSYSTEMS

Skills

Subject

Science

Grade Level(s)

3 - 5

Site

Class, pond

Author

C. Walsh

Objective

The student will be able to:

1. discover that living things are interdependent
2. describe the influence of pollution on living systems.

To The Teacher

In this activity the students will discover the relationship between plant and animal. They will learn that a green plant and a snail in a sealed environment depend on physical factors (eg., air, water, temperature). The green plant carries on the process of photosynthesis from the sun's energy to make it's food. The snail depends on the plant for food and oxygen, by-products of photosynthesis; the snail in return releases carbon dioxide into the water which the plant takes in for it's food-making processes.

In the second part of this investigation the student will set up and observe the operation of a polluted plant environment, applying this information to the effects of pollution on today's world.

Before You Begin

You will need: clear plastic bags, rubber bands, aluminum pie pans, water snails, water weeds, pond or aquarium water

Words To Know

Photosynthesis, milliliters, hypothesis

ACTIVITY

1. Pour 500 milliliters (½ liter or 1 pint) of pond water into a plastic bag. Put a part of a water plant into the bag. ex: (Elodea) Put a small fresh water smail into the Bag. Close the bag tightly with a rubber band so that no air can get into the bag.

2. Lead a discussion:

(a) ask the class to hypothesise how long the snail and plant can go on living in the sealed bag?

(b) ask the class what would happen if the snail and plant were in different bags?

(c) ask the class to list the necessities of life for the snail?

(d) ask the class to list the necessities of life for the plant? (basically food, oxygen, carbon dioxide, light, warmth)

3. Have the students draw a diagram showing how the needs of both the plant and animal in this small world are being met.

4. Ask the class to oredict the effects of pollution on the plant's ability to produce oxygen for the snail.

5. Pour equal amounts of pond or aquarium water into two test tubes. To one add detergent. Place two water plants in the test tubes. Invert the test tubes into a large container of water and put in the sun. Photosynthesis will occur and the oxygen will be trapped at the top of the test tube. Then, compare oxygen production and plant condition to determine the effects of the polluted water.

6. Now ask the students to diagram the effects of pollution on the oxygen cycle between plants and animals.

7. Discussion on our polluted waters should follow. How does this effect marine life? World food supply?

Bill O'Malley

Conservation News

Related Activities

1. Research the most polluted waters of the world. Plot them on a map.

2. Research/list the greatest industrial centers of the world. Plot them on a map.

3. Make a list of the waters not polluted by industry.

4. Write to these towns, counties, states, countries to determine what plans have been made to portect these waters from industrial pollution.

Credit

1. Concepts in Science, Harcourt Brace, Jovonovich, Inc., 1975, p. 49 - 54.

2. B. J. Amundson, and Nick Rodes, Knock the Four Walls Down, P. A. Schiller and Associates, 1974, EEC #349 B.

Notes To Myself

Bird 'n Worms

Curriculum Topic

ECOLOGY/BIOLOGY

Environmental Topic

ECOSYSTEMS

Skills

locating and obtaining information, predicting, critical thinking, observing

Subject

Science

Grade Level(s)

3-5

Site

school grounds, classroom

Author

Arthur C. Braun Jr.
Antoinette R. Giovannitti

Objective

Students will be able to:

1. describe the value of protective coloration to living organisms

To The Teacher

The study of earthworms is a part of the study of animals, adaptation, soil and the interrelationship of living things. Earthworms can be found in almost any place where there is moist earth, even on lawns in front of high-rise apartment houses and on other plots of city soil. While earthworms are nocturnal animals, they can be located during the day by the piles of castings around their holes, and also by their presence above ground during and after a rain. In cities, they are frequently found stranded on sidewalks after a rainstorm.

The earthworm is well adapted to moving through the soil. Its streamlined body offers little resistance. Earthworms, of which there may be one million per acre, not only aerate the soil and contribute to its waterholding capacity, but they bring deeper soil materials to the surface and contribute to soil mixing and decomposition. Recent studies have shown that this amount may vary from 2.1 tons/acre/year in hot dry soils to 10.7 tons/acre/year in prairie soils, to 107 tons/acre/year in tropical delta soils.

The earthworm is one living organism in a complex biotic community. If one were to examine the leaf letter of the forest floor, turn over a rotten log, or part the blades of grass and herb cover of a rich meadow, one could view a variety of insects, isopods, spiders and myriapods. But those which are easily seen represent only a small portion of the total community. They are interacting with a great number of smaller forms - collembola or springtails, mites, nematodes, annelids (earthworm), and so on. Also part of the food chain are vertebrates which patrol the area - salamanders, reptiles, shrew, mice and ground-dwelling or hunting birds.

One adaptation of organisms to the environment is camouflage or protective coloration. This adaptation is found throughout the animal kingdom, in species such as the wold rabbit, chipmunk, earthworm, praying mantis, etc.

The following activity shows that even humans would primarily locate and select those objects which are more easily seen and do not blend into the environment. They consider those objects which are better camouflaged last because of the difficulty in discriminating between the environment and object. Therefore, their behavior is like that of many predators which depend primarily on their sense of sight.

Before You Begin

Materials:

white butcher paper marked off in blocks 1 to 30

1	2	3	4	- - - -

various colored pipe cleaners (pre-cut into 3 pieces) (green, red, blue, yellow, brown) (toothpicks and clay are alternatives)

Words To Know

camouflage, sequence, flights, habitat, biotic community, aerate, interact, extinction

DNR Art Department/Janice Hawkins

Conservation News

ACTIVITY

1. When doing unit on animals and specifically the earthworm, discuss its ecological role. (See Teacher Background.)

2. Announce the following activity:

   a. Pass out 3 or more colored pipe cleaners to each student (each pipe cleaner will be used to make one worm).

   b. Have students twist or bend pipe cleaners into snake like forms or S's (collect them)

   c. Give each student the name of a bird to impersonate. (They may choose their own e.g. robin, thrush, meadowlark, bluebird, flicker, crown, bluejay, sparrow, canary and starling.

   d. Go outside onto the school grounds.

   e. Place a large white paper on the ground with numbered blocks.

   f. Scatter a known number of "worms" over an area of the playground, in the grass, on the parking lot, or on bare soil. Mark boundaries of the area clearly. Have the students turn their back while you scatter worms.

   g. One at a time call out the names of the birds. As each species is called, the student representing that species can "fly" out over the area where the "worms" were scattered and pick up the first worm which catches the "bird's eye." (Child must take only one worm at a time.)

   h. As the students return from their flights, ask them to lay out their worm on the large piece of white butcher paper in the order picked up.

   i. Repeat the process until all the students have made at least "one flight" returning with the first worm they see.

3. Consider the following questions for discussion;

   a. What is the color sequence of the "worms" captured and placed on the paper.

   b. What are the trends or pattern that occur? (Bright ones are picked up first - not blend into environment)

   c. If the worms were scattered on the grass, what might the color patterns be? (green "worms" on grass would be picked up toward the end of the game rather than in early flights)

   d. What is the relationship between coloration and the usual habitat of the worms? (If they blend in chances of survival increase - therefore possibility of extinction decreases.)

   e. Have students name other animals that use camouflage to aid in survival? (answers will vary)

f. Ask each student to describe the value of protective coloration to living organisms.

4. Discuss with the class:

   a. In what ways do animals protect themselves? (swiftness, hard shells, change colors?)

   b. When animals change colors, what colors do they change to? (white, grey, brown). Why do they change to these colors? (To blend in with the environment)

   c. What animals do not change colors, but also blend in with the environment? (ex. earthworm, nesting birds, fish, most baby birds are dull colored, forest animals are striped and speckled to match surroundings because solid colors would be easily seen.)

Resources

Southwick, Charles H., Ecology and the Quality of Our Environment, New York, Van Nostrand Reinhold Company, 1972.

Russell, Helen, Ten-Minute Field Trips, Chicago, Illinois, J.G. Ferguson Publishing Co., 1973.

Credit

"Bird 'n' Worms, Project Learning Tree, p. 115.

Russell, Helen, Ten-Minute Field Trips "Earthworms," p. 64-67.

Southwick, Charles H. Ecology and Quality of Our Environment, New York, pp. 243-250.

Notes To Myself

Construct an Adapted Animal

Curriculum Topic
HUMAN ANATOMY - ECOLOGY

Environmental Topic
ECOSYSTEMS

Skills
Problem-solving,
recognizing problems
developing a plan of action

Subject
Science

Grade Level(s)
5

Site
Classroom

Author
Paul Sanderson

Objective

The student will be able to:

1. construct a model animal that is adapted to a specific habitat.
2. name several morphological characteristics existing animals have that adapt them to their habitat.

To The Teacher

Through the process of genetic change, animals have been able to adapt to and survive in specific, often demanding environments. This process is called evolution. Members of a population of organisms who by chance inherit the genetic ability to survive in a particular habitat will then reproduce and pass similar advantages to their offspring. This activity will enable your students to construct an "animal" that is specifically adapted to a defined habitat.

Before You Begin

Materials: Collect a quantity of consumable materials for construction of a model animal. This list might include: cardboard, paper, paper mache, wire, papertowel rolls, aluminum foil, plastic bottles, wood, yarn, string, cloth, buttons, marbles, sticks, pens, crayons, stapler, masking tape, glue, paint, egg cartons, etc. Use your imagination. Materials need to be collected in large enough quantities to meet class needs, and allow adequate collection time. Many useful items can be found in the trash for recycling. Ask students, parents, and other teachers for collection assistance.

Preparation: Find pictures of animals that have distinct morphological traits (e.g. giraffe, snake, penguin, fish, whale, eagle, turtle, polar bear). Study them to learn how these traits help them to adopt to their environment. National Wildlife Magazine is a good source.

Prepare several habitat descriptions. These will be the environments for which the students will build their "animals". Some ideas might be:

a. A desert climate, with only a few water holes. Food sources: tall trees with big leaves and fruit.

b. Snowy mountains with dangerous carnivarous predators. Food source: tree bark.

c. Dark city sewers. Food source: garbage. Predators: alligators.

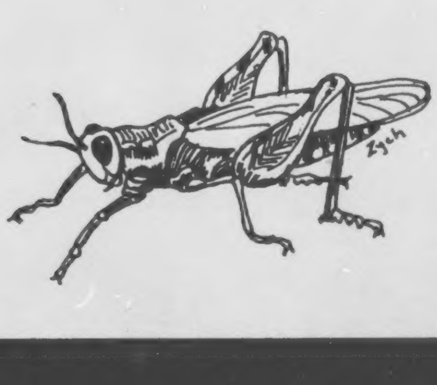
Words To Know

habitat, environment, carnivore, predator, trait

Resources

"Invent an Animal", Outdoor Biology Instructional Strategies, University of California, Berkeley, 1975, EEC #356.1.

"Primary Ecology", Computer Based Resource Unit, New Jersey State Council for Environmental Education, 1977, EEC #854.



ACTIVITY

1. Introduce the activity to the students by explaining that all animal life has basic needs: food, water, protection from the environment (weather, predators), reproduction, etc.

2. Show the animal pictures you have collected, and have your students explain how these animals are adapted to a specific environment.

3. Describe to students the prepared environments.

4. Show students the collected materials and challenge them to "build" an animal that could survive in those conditions. Encourage creativity. Share ideas that students discover as they work.

5. Have students share their completed creations with their classmates. Have each student explain how their animal is suited to the specific environment chosen. Students should consider and discuss the following:

   a. What does the animal eat? How?

   b. How much water does it use? Where does it find it?

   c. How does it move? Is it fast, slow, tall, short?

   d. How does it protect itself from its environment? Heat, cold, dark of night, predators, etc.?

   e. How does it reproduce? Live births, eggs, litters, small births?

6. Brainstorm as a class, how man might adapt to a new environment, such as: one with dirty air and water, excessive noise, over-crowded urban areas, food shortages, etc. (basically a pessimistic outlook on man's future).

   a. How would human beings look?

   b. What might we improvise or devise to compensate for a change in environmental quality?

   c. What animals, if any, can manipulate their environment? (man?)

   d. What animals, if any, can manipulate themselves in order to "adapt" to their environment? (man?) How?

7. Have students together draw on a blackboard what this human might look like. Make it a composite, group effort. "Brainstorm" the drawing. Then ask the class:

   a. Would you like to look like this? Would you like humans to avoid such a change? Why?

Related Activities

1. Take a trip to the zoo. Discuss the animals observed there, and how they are suited to their original habitat. How are they suited to the zoo habitat?

2. Study prehistoric animals, or fossils. Discuss how they did not make the transition between changes in environments.

3. Do the activity outside using habitats on the schoolyard.

Predator's and Their Prey

Curriculum Topic

ECOLOGY

Environmental Topic

ECOSYSTEM

Skills

Applying information

Subject

Science

Grade Level(s)

3 - 5

Site

Anywhere in or outdoors

Author

Orah Elron

Objective

After completing the activity, the student will be able to:

1. describe the web-like character of interdependence for food among organisms.

To The Teacher

All organisms that live in a certain site (space) are interdependent on each other for food. They either eat each other - as predator and prey (mice are prey to hawks), or share the same available food (deer, rabbits and sheep might share the grass in a meadow). The interdependence of a community can be expressed by the food web that exists among all the different populations that belong to this community. In the following activity the players represent different populations of one big community.

Before You Begin

Materials: The only material used is a ball of string for each group of 7-15 players and big paper labels to mark each population (on the forehead or the shirt). The time necessary may be as short as 10 minutes to play.

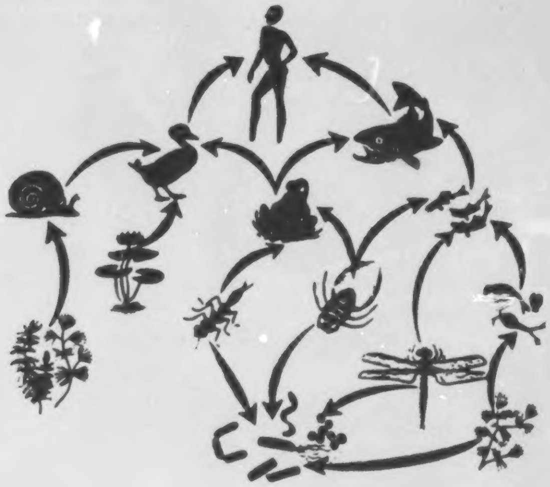
Preparation: Prepare a set of labels for the first round in advance of class. Player labels could include:

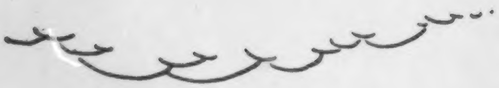
Players for the FOREST community: pine tree, leaf, seed, nut, squirrel, small bird, hawk, mushroom, opossum, chipmunk, mouse, owl, blue jay, deer, fox, etc.

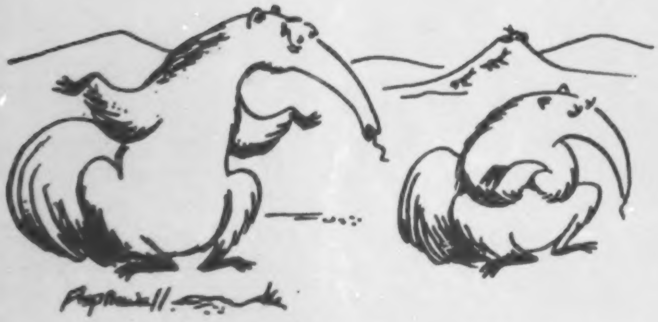
Players for the POND cummunity: crayfish, beetle, green algae, diatom, blue-green algae, moss, bacteria, cattails, pond weed, grass, pond lily, frog, worm, copepod, mayfly, mosquito, spider, snail, trout, yellow perch, tadpole, turtle, etc.

Words To Know

food web, food chain, interdependence, predator, prey







"But you can't be a vegetarian."

American Red Cross Youth Journal

ACTIVITY

This activity is a short game that should serve as an illustration for learning concepts and as motivation towards further independent study concerning food webs in different communities.

1. Divide the class into groups of 7-15 students. Have each group assemble in a circle on chairs or on the floor.

2. Have each group select a community from the sets you have prepared FOREST, POND, MEADOW (grass area).

3. After a group selects a community, give them a set of organism labels (prepared in advance). Let each student select a plant or animal label from the stack. Each student should place a label on his forehead (if sticky backed) or on shirt (with a common pin).

4. Give each group a ball of string.

5. The first player to start holds one end of string in one hand and throws the ball with the other hand to another organism what is food for or predator to him/her. In this game the direction of who is food to the other is not indicated. The game continues until there is no new food or predator to which an organism can throw the ball of string. (i.e. an organism cannot throw a ball of string to the same organism twice.)

Example: The "mouse" starts throwing the ball to the "hawk". The hawk may continue to any other animal that either eats him or is eaten by him (for instance, the "small bird").

6. As the string is passed around, everyone who had the ball in his hands holds on to the string with one hand and unwinds the ball further to throw it with the other hand, thus the "web" becomes more and more confused while every "organism" holds several ends of string in his one hand:

START owl bird man apple

grass

cow

snake

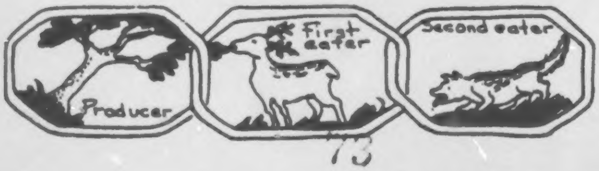
mole

beetle squirrel seeds mouse

plant eating

7. In additional rounds the communities will be switched among the circles. It is also advisable to let the students choose organisms they wish to be. (Will they be able to create a food web?) Are students aware of the complicated interrelations in any given community? The game should help them to understand better these food webs.

8. In subsequent rounds players may select a community of their choice. In each community, a player may select his own organism. The success of their community will depend on the diversity of the organisms.



9. Discussion questions:

   a. Were there any organisms in your community that were not part of the food web ("left out" of the game)?

   b. Who had the most strings in his hand - was connected to almost every one the organisms? (A decomposer, bacteria or mold might eat every other organism in the community.)

   c. How many plants, herbivores, carnivores, omnicores were in each community? Can one of these groups be missing?

   d. Are there several organisms having common food, common predators, that could replace each other in the food web?

   e. Let the students draw a diagram of the connections that appeared in "their community".

Resources

There are many other food chain and web games - see OBIS EEC #356, Set II, 1975, Food Chain Game.

Credit

Elron, Orah and Amelia Terkel, Our Mice and Hamsters, "Matal", Science in Elementary School, Tel-Aviv University, Israel, 1975.

Notes To Myself

What Happens to Animals After They Die?

Curriculum Topic
ECOLOGY

Environmental Topic
ECOSYSTEM

Skills
Observing, analyzing information, concluding

Subject
Science

Grade Level(s)
4 - 6

Site
Classroom

Author
Orah Elron

Objective

The students will be able to:

1. explain the part of decomposers in the food web,
2. describe by diagram the position of decomposers in the food pyramid (or food cycle).

To The Teacher

When students first learn about food chains and the food web in nature they tend to see only producers (plants) and consumers (animals). They do not recognize that decomposition is also a vital part of the cycle of life. Students who raise animals at home, especially small animals as for example fish in an aquarium, know death. But do they connect this with the recycling of living matter as part of the food web?

In the following simple experiment students encounter decomposition by molds and bacteria. Even young students have seen mushrooms and fungi in the woods. They may also know that food left outside the refrigerator decomposes. They have seen molds on fruit or spoiled bread. In this activity the student watches the decomposition of a dead fish or dead plant through the "window" of a tightly closed glass jar. They can follow the process without any side effects such as the smell of decay.

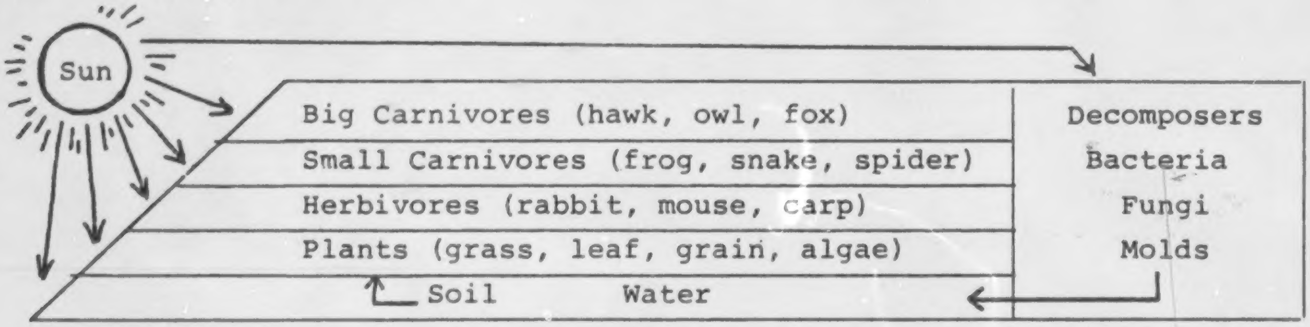
They will infer that tiny organisms feed on the dead animals and plants until they appear to disappear. Then they will be led to understand that the decomposed organisms become food for new plants. (You can tell them about compost, if possible show them how compost is used in a garden.) Students will learn that decomposers return the dead organisms to the food cycle, they "recycle" dead animals and plants.

At the end of this activity, after at least 4 weeks, you can ask the students:

1. What is the part of the decomposers in the food chain (food web)?

2. What would happen in a world without decomposers? How would the woods, the garden look?

If the students have drawn food webs before, ask them to add the decomposers to their picture. You could use the following diagram as conclusion:


Sun
Big Carnivores (hawk, owl, fox)
Small Carnivores (frog, snake, spider)
Herbivores (rabbit, mouse, carp)
Plants (grass, leaf, grain, algae)
Soil
Water
Decomposers
Bacteria
Fungi
Molds

Before You Begin

It is advisable to work in small groups of 3-5.

Materials: for each group; small dead organism (guppy or other fish from aquarium, dead tadpole or worm, and/or dead plant), 1 clear glass jar with tight screw on cover, enough sand to fill each jar 2/3 full, plastic cup, plastic spoon, paper labels, 3 "control" glass jars with cover and sand, 2 plastic "fish" (or other little toy animal)

If this activity is not part of a larger unit, introduce the food chain and food web before starting.

Words To Know

decay, decomposition, bacteria, fungi, molds, food web, food chain, cycle of organic matter in nature

ACTIVITY

1. In a young class it is advisable to show the students exactly what they will do: first examine the fish (or other dead organism) thoroughly. Measure it, write down its color and skin patterns. Will the animal change?

2. Give each group the equipment and worksheet so that they are able to work alone without help from the teacher. Remind student to label each jar.

3. Decide where the groups can place their experiment, so as to observe it easily.

4. Introduce the subject of control in an experiment. What controls will we need in this experiment?

5. Have one student from each group form a new group for control jars. What parts of the experiment must be controlled: the dead organism, the sand. The students will prepare the 3 control jars:

   a. one jar of dry sand to bury dead fish (Why?)

   b. one jar of wet sand to bury plastic toy animal (Why?)

   c. one jar of dry sand to bury plastic toy.

Control jars will be placed on the same shelf for all groups to observe. Students could discuss their hypothesis: What will happen in the control jars? What will happen in the other, wet sand jars?

6. Students will write their observations weekly on the worksheet. After 3-4 weeks summarize the observations with the whole class. (See To The Teacher)

7. Discussion Questions:

   a. What are the changes they observed in jars with plant and fish buried in wet sand? After first week? After two, three weeks? After four to five weeks?

   b. What do students give as cause for these changes?

   c. Did students observe similar changes in the control jars? Toy in dry sand. Toy in wet sand. Fish or plant in dry sand. How can they explain the differences?

   d. What happened to the decayed material? (It became food for fungi and bacteria) Did students notice changes in the color of the sand?

   e. What happens to decayed, dead, organisms in nature, in the woods, fields?

   f. What would happen if dead organisms did not decay? It is important to stress the cycle of organic matter in this activity. Students will learn that death is a normal part of the life cycle.

Related Activities

See "The Good Bacteria" another activity in this notebook.

Credit

Elron, Orah and Amelia Terkel. "Our Aquarium", "Matal", Tel Aviv University, 1977.

Drawing: Cecelia Zych

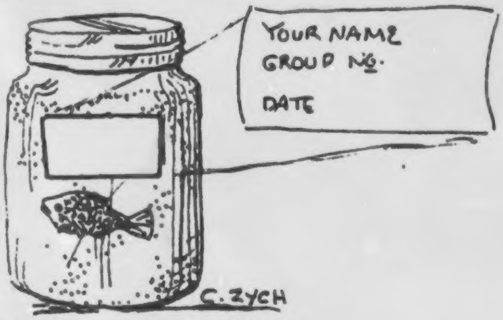
STUDENT PAGE

1. FILL THE GLASS JAR WITH CLEAN SAND. WET THE SAND THOROUGHLY, BUT DON'T LET ANY SURPLUS WATER STAY IN THE JAR.

2. PLACE THE DEAD FISH AND DEAD PLANTS UNDER THE SAND SO THE YOU CAN SEE THEN FROM OUTSIDE THROUGH THE GLASS.

3. CLOSE THE JAR TIGHTLY.

4. PUT A LABEL ON THE JAR WITH:
   YOUR NAME, NUMBER OF
   YOUR GROUP (A, B, C...)
   DATE OF BURIAL



5. WRITE ON THIS WORKSHEET:
   A. DESCRIPTION OF DEAD ORGANISMS WHEN WE BURIED THEM:

      AFTER ONE WEEK:

      AFTER TWO WEEKS:

      AFTER THREE WEEKS:

      AT END OF EXPERIMENT DATE:

6. WHAT DO YOU THINK WOULD HAPPEN TO THE FISH IF WE LOOKED AT THEM AFTER 10 YEARS? WHAT WOULD WE SEE?

Ecology Puzzle Undoing

Curriculum Topic
ECOLOGY - Interrelationships

Environmental Topic
ECOSYSTEM

Skills
Observing

Subject
Science

Grade Level(s)
3-8

Site
Natural outdoor area

Author
Ed Lisk

Objective

The student will be able to:

1. recognize that interconnections exist in the natural environment,
2. identify the interrelationships that exist among the items he collects and observes.

To The Teacher

One of the most important principles of ecology is that all living things are connected. Every living thing must find resources with which to grow, maintain and reproduce itself. Each living thing provides and receives resources.

Plants provide oxygen in the process of photosynthesis, during which they receive light energy which is then stored in the cells and eventually provides food for animals. In the competition for light to carry out this process, large plants may shade small ones. A further function of plants is their protection of the soil from erosion.

Animals provide plants with carbon dioxide from their breathing and fertilizer from their wastes. Some animals receive food by eating the plants themselves, others receive it indirectly by consuming plant-eating organisms. Herbivores (plant-eaters) may help control plant populations, as predator controls prey. If there are too many predators, however, the decline in numbers of their prey brought bout by their own increase will cause a food shortage among them. Other animal populations are controlled in the competition for limited food or living space.

Decomposers (bacteria and fungi such as mushrooms) use dead plants, animals and animal waste as energy sources. In doing so, they recycle nature's left-overs. Many small animals in the soil do the same. This process returns nutrients - nitrogen in particular - to a suitable form for plant use.

First steps towards an understanding of interrelationships in the natural world are to find and observe them, and eventually to identify their elements and functions.

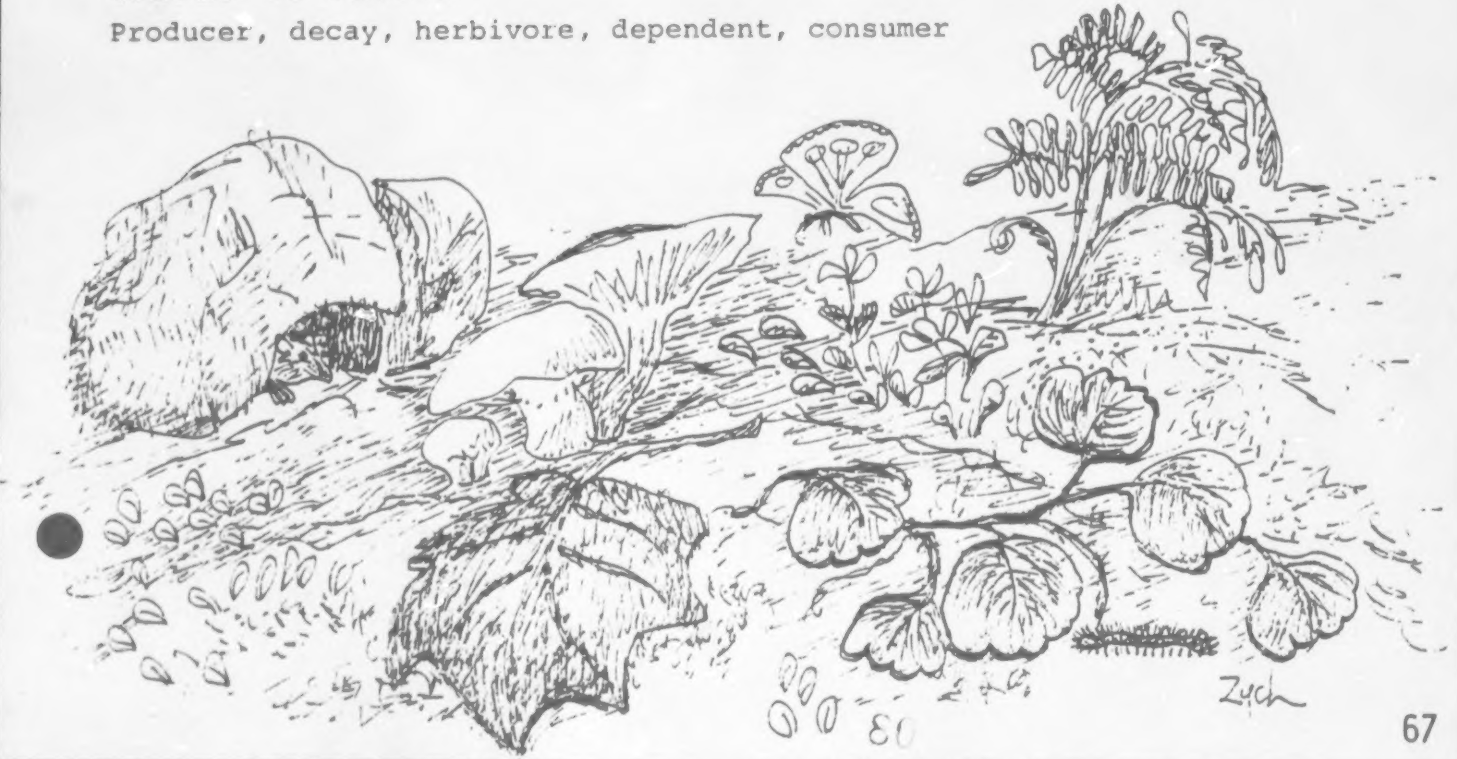
Before You Begin

Materials: small plastic bag or container for each student, 1 large plastic or paper bag, tags for making non-collectable objects, 2 or 3 baby-food jars, pencils and Student Worksheets (as provided here)

Preparation: Find a natural site with a diversity of habitats. Try the survey beforehand yourself.

Words To Know

Producer, decay, herbivore, dependent, consumer



ACTIVITY

Purpose: to find the parts of nature's living puzzle, using clues and questions on the Student Worksheet provided here.

1. Give each student worksheet, pencil and collecting-bag, making students aware of the distinctions between "Bring Back" and "Write About" sections on the worksheet.

2. Direct the students to take small specimens which they will eventually show to their classmates. Advise them not to disturb nature's system by taking unnecessarily large samples.

3. When the treasure hunt has ended:
    a. Ask individual students to share their results.
    b. Discuss how the specimens reveal the interconnectiveness of nature.
    c. Assign each student to write an essay on his/her favorite find. The focus of this essay should be how it is connected to at least one other living thing.

Related Activities

1. Construct a water or land terrarium.
2. Visit other ecological systems: pond, field, forest.

Resources

Project I-C-E; Green Bay, Wisconsin, EEC #607.2

Betros, Harry, Understanding Schoolyard Ecology, Exposition Press, 1972, EEC # A23.

McCombs, L.W. and R. Nicholas, What's Ecology?, Addison-Wesley, 1973, EEC # 394.

Credit

Drawing: Cecelia Zych

Notes To Myself

STUDENT PAGE

Treasure Hunt Clues

Find as many of these as you can in the time you have to work. Think carefully about each clue. Find the parts of nature's puzzle. What makes nature operate? Check off the clue when you find an answer. Use only one clue for each thing.

Bring Backs

____ A small thing waiting to grow into something bigger.

____ An animal which recycles nature's waste.

____ The smallest bit of life that makes food from sunlight energy.

____ A small animal with 4 wings.

____ A plant (part) which hitches a ride.

____ An animal eaten (when it is caught) by another animal.

____ Two plants which live together.

____ A color which captures sun energy.

____ A hiding place for a small animal.

____ An animal which lives in dark places.

____ A plant which does not make its own food.

____ Some animal with 6 legs.

____ A twig with opposite branches.

____ An animal which eats plants.

____ An animal which crawls but will change to one that flies.

____ A small plant that floats on the water in a puddle or small pond.

Write Abouts

The home of a large animal ____________________

A flying animal that sings ____________________

A place where animals raise their babies ____________________

A sign left by a large animal which tells who he is ____________________

The biggest living thing in your study area ____________________

The protective coating of a large plant ____________________

(tell its color and how it looks) ____________________

A liquid which is important for life ______________________________

The thing which gives energy to all the life in your area __________

A group of living things which are all very much alike _____________

____

Two things which are very much alike and why _______________________

____

____

Conservation News

The Food Web Game

Curriculum Topic

ECOLOGY

Environmental Topic

ECOSYSTEM

Skills

Applying learned knowledge, organizing information, evaluating information

Subject

Science

Grade Level(s)

3 - 5

Site

Classroom

Author

Orah Elron

Objective

The student will be able to::

1. explain the web-like character of interdependence among organisms concerning food resources,
2. work in small groups, and help each other to find answers to questions before asking the teacher.

To The Teacher

All the energy imput in the biosphere of the earth originates from the sun. Plants are able to transform sunlight energy through photosynthesis into food energy; thus plants are called producers. Animals cannot make their own food, they are dependent for their food on eating plants or other animals. Plant eater are called hervivores, they are the primary consumers. Secondary consumers are the carnivores who feed upon herbivorous animals. All animals that feed upon other animals may be termed predators. This includes the robin catching a worm and the dragonfly feeding on mosquitoes as well as hawks, owls, snakes and man himself. Some animals, like man, are called omnivores because the eat both plants and other animals.

ACTIVITY

1. Divide class in small groups of 3-6, to sit around small tables (2 desks can be moved together for each group.)

2. Xerox play sheet from included example and give one play sheet to each player.

3. Have each student bring his already prepared cards in an envelope and place cards in center of table (1 envelope less than 3 players - 32 cards for 3, 48 for 4, etc.)

4. Have student read the rules of the game and add additional information if that seems necessary.

5. Students have to draw arrows on their play sheet from food to the one who eats it. The "yellow" decomposers will "eat" any other card on the sheet, thus providing the largest number of arrows.

6. The players may continue for 10 rounds or until all the cards are used, making on each play sheet a web-like criss cross of arrows.

7. The one with the largest number of arrows wins the game. The teacher may walk aroudn the players' tables and make sure that all the available connections are marked on each sheet.

8. Any questions that come up should be answered at first by the group itself.

9. Should the students be unable to find an answer they might write the questions down and discuss them at a debriefing session.

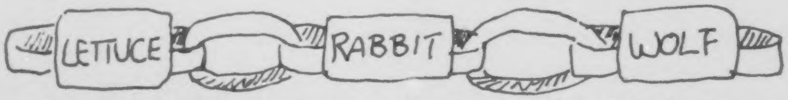
10. There are not necessarily right answers. Some people in the world do eat grasshoppers, some locusts eat anything,that grows.

11. It might be advisable to add more organims to the game; for instance, animals the students have talked about in some other context in class.

12. Discussion questions:
    a. Discuss any food chain relationships students are certain of.
    b. The students can explain the term "web".

Related Activities

1. The colored cards may be used to construct a model of food chains and the food web. The picture cards can be glued to paper rings: each card to a paper strip of about 8" (20 cm) that can be closed to form a paper ring. These rings should be connected by additional rings of colored paper so that they form a food chain:



After constructing the simple chains, the students will be asked to add all other existing connections through additional colored paper links. The result is a very confusing "web".which might serve as a decoration in the classroom. One could also use the picture cards to construct a food web mobile as decoration for the classroom.

It is important to include in this system the decomposers, those plants and animals which break down dead organic material into its components for reuse by green plants. When we think of a certain animal and its food we can construct a simple food chain:

Trees procide food for squirrels that are caught by owls for their food.

Green leaves are food for insects which are food for many birds.

In ecosystems, the existing food chains over-lap a great deal so that we find complex food webs. The following game can help students to illustrate the complexity of food webs in nature.

Before You Begin

Materials: Xerox the card page and the play sheet for each student. It seems advisable to tell the students about the game in advance and let them color and cut the picture cards at home. (Color either the background or the animal in the indicated color.)

This game can be played during one 45 minute session in the classroom, in small groups of 3-6 students around each table.

Words To Know

photosynthesis, producers, herbivores, primary consumers, carnivores, secondary consumers, predators, prey, omnivores, decomposers, decay, food chain, food web

SEE NEXT PAGE FOR ACTIVITY

Resources

Elron, Orah and Amelia Terkel, Our Mice and Hamsters, "Matal", Science in Elementary School, Tel-Aviv University, Israel, 1975.

RULES FOR THE PLAYERS

3-6 STUDENTS CAN PLAY AROUND A TABLE.

WITH AT LEAST 32 COLORED LITTLE CARDS, EVERY PLAYER RECEIVES A PLAY SHEET AND A PENCIL.

MIX ALL THE CARDS THAT ARE IN THE CENTER OF THE TABLE AND TURN THEM UPSIDE DOWN. ONE AFTER THE OTHER-AROUND THE TABLE-EACH OF THE PLAYERS MAY TAKE A CARD AND PUT IT ON THEIR OWN SHEET IN THE PROPER PLACE.

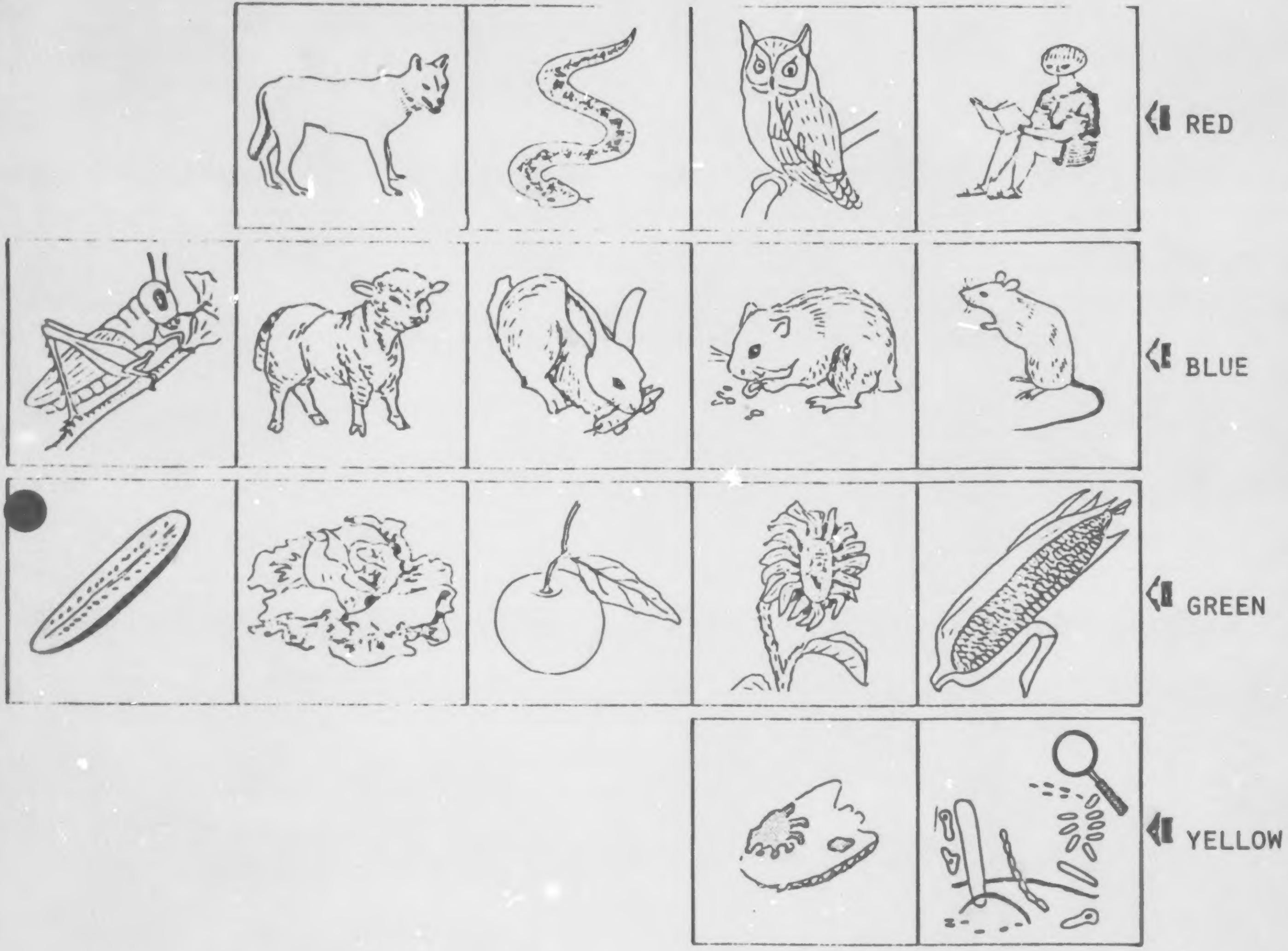
AFTER ONE ROUND EACH PLAYER TAKES A SECOND CARD. SHOULD THIS CARD BE EITHER FOOD FOR OR A PREDATOR OF THE FIRST CARD, THE PLAYER MARKS AN ARROW FROM THE FOOD TO THE ONE WHO EATS IT. YOU MAY ALWAYS CONNECT EACH NEW ORGANISM WITH ALL THE OTHER CARDS YOU HAVE ON YOUR SHEET THAT ARE EITHER FOOD OR PREDATOR TO THE NEW ONE. THUS, EACH NEW CARD WILL ADD A NUMBER OF NEW ARROWS TO THE FOOD WEB ON YOUR SHEET.

IF THERE ARE QUESTIONS CONCERNING THE FOOD OF AN ORGANISM, TRY TO FIND THE ANSWER IN YOUR SMALL GROUP. IF YOU CANNOT MAKE UP YOUR MIND ABOUT THE RIGHT ANSWER, (DO GRASSHOPPERS EAT APPLES?) WRITE THE PROBLEM DOWN AND BRING IT UP LATER WHEN THE WHOLE CLASS CAN FIND AN ANSWER.

THE GAME MAY END AFTER 10 ROUNDS OR WHEN ALL CARDS ARE USED UP. THE WINNER IS THE ONE WHO HAS THE LARGEST NUMBER OF ARROWS. WHAT CARDS ARE THE "BEST" ONES BECAUSE THEY ADD THE LARGEST NUMBER OF ARROWS ON YOUR SHEET? CAN YOU UNDERSTAND NOW WHY WE SPEAK ABOUT A FOOD "WEB" AND NOT ONLY ABOUT "FOOD CHAINS"?

THE FOOD WEB GAME

PLAYING CARDS


RED
BLUE
GREEN
YELLOW

THESE PICTURES WILL BECOME YOUR PLAYING CARDS AFTER YOU COLOR THEM ACCORDING TO THE INDICATED COLOR AND CUT THEM INTO 16 LITTLE SQUARES.

STUDENT PAGE

FOOD WEB PLAY-SHEET

PREDATORS

PLANTS

PLANT EATERS

DECOMPOSERS

Grow a Venus' Flytrap

Curriculum Topic

CHEMISTRY: Plants have particular chemical needs.

Environmental Topic

ECOSYSTEMS - The form of life found present depends upon the coincidence of its life needs and their availability in an environment.

Skills

Observing
Experimenting
Concluding

Subject

Science

Grade Level(s)

5

Site

Classroom

Author

Paul Sanderson

Objective

The student will be able to investigate the need for nitrogen in plants.

To The Teacher

Some environments do not readily supply the special chemical needs of plants. Such is the case with bogs and marshes. The soil there is usually depleted of the nitrogen which is necessary for plant life. In order to compensate for this lack of nitrogen, some plants have become carnivorous, obtaining the supply of nitrogen from insects and spiders which they catch and eat. The Venus'-Flytrap is such a plant. It has small traps on the ends of its leaves. When an insect lands on the leaf, these traps close tightly. The plant then secretes a special digestive juice in order to eat the insect and obtain the nitrogen.

The Venus'-Flytrap is a good example of how plants can adapt to fit an otherwise uninhabitable environment. They can be grown easily in the classroom and are fun to use for both observation and experimentation.

Before You Begin

1. Venus'-Flytraps can be obtained from greenhouses, garden centers, biological supply houses and even local supermarkets.

2. Instructions for growing the plants come with your purchase. Follow them closely. Purchase a supply of nitrogen-rich soil and a soil-testing kit. (Your state Agriculture Department may be willing to do soil testing.)

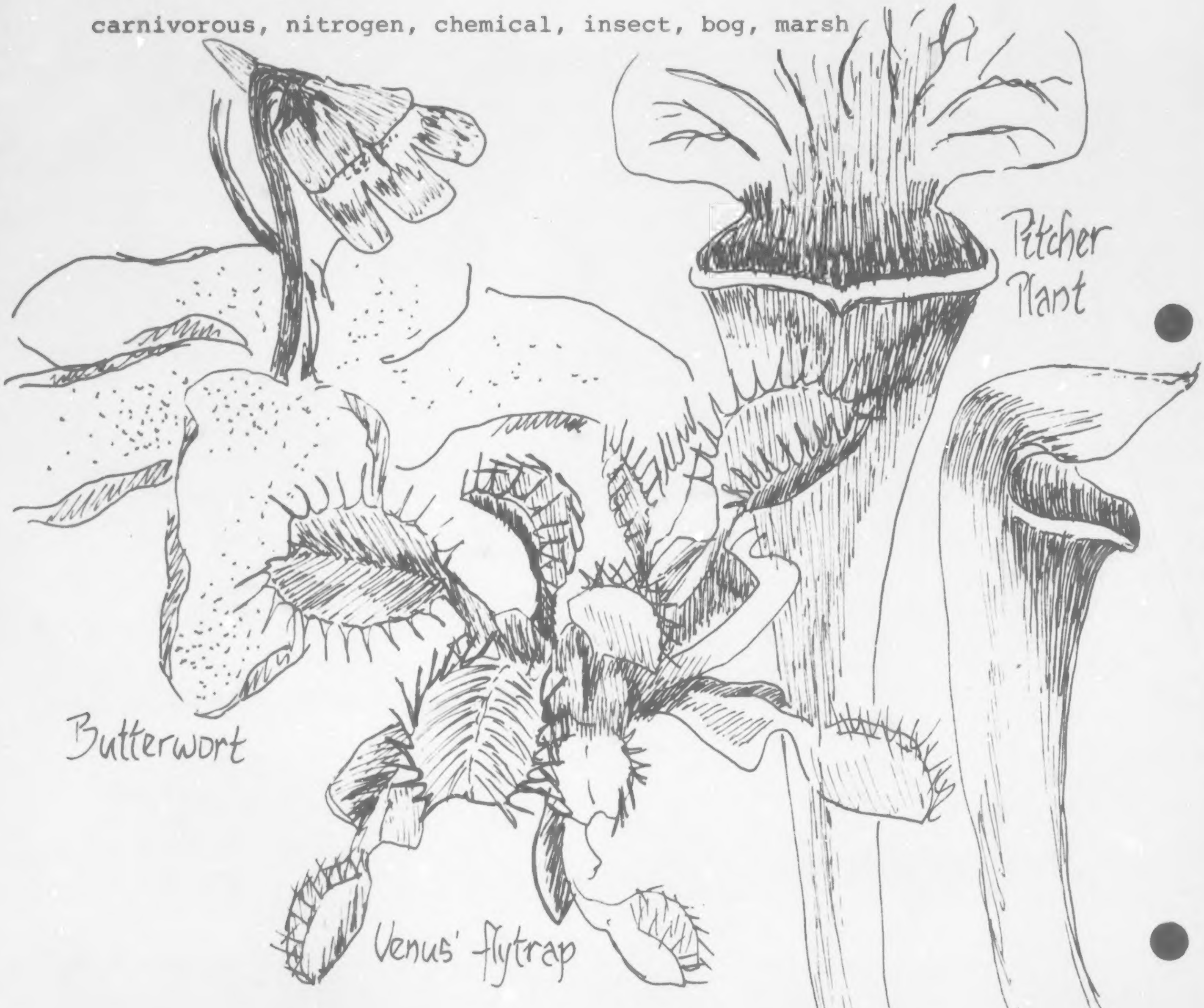
3. Collect "sources of nitrogen" to feed your plants. Hamburger and insects usually work well. Follow the feeding instructions, and DO NOT OVERFEED.

4. Find a location suitable to growing. The plants need a sunny, warm, ~~moist habitat~~. A very small greenhouse or plastic bag over the pot works well.

5. You will also need a more typical houseplant and some nitrogen-poor soil to perform the experiment. See the experiment procedures for more specific directions.

Words To Know

carnivorous, nitrogen, chemical, insect, bog, marsh



ACTIVITY

1. Introduce the activity by describing the chemical needs of plants: H_2O, O_2, CO_2, nitrogen and other minerals.

2. Explain that plants typically receive their nitrogen from the soil.

3. Perform the following experiment:

Students will first plant a typical house plant, such as a coleus or philodendron, in nitrogen-poor soil. Next, they plant the Venus' Flytrap in similarly nitrogen-poor soil and feed it insects or hamburger. Eventually, the Venus'Flytrap is to be compared to the control plant to show growth results. The flytrap should have remained healthy while the control plant (coleus, etc.) in nitrogen-poor soil may have lost color and yellowed. This condition is later remedied by adding nitrogen-rich plant food to the soil.

4. Discussion questions:

a) Name some of the chemicals necessary for plant life. (O_2, H_2O, CO_2, N_2)

b) In the experiment, what happened to the plant in N_2-depleted soil? Why?

c) How do plants usually obtain nitrogen? (from the soil)

d) In the experiment, from where did the flytrap get its N_2? (From insects or hamburger it ate.)

e) Learn by research where the Venus' Flytrap lives. How has the Venus' Flytrap adapted to its environment?

Related Activities

1. Visit a bog. Record observations.

2. Observe or investigate to find information about other carnivorous plants, such as the pitcher plant. Compare and contrast them to the Venus' Flytrap.

Resources

McCue, Geo., Ecology: The Freshwaters and Man, A Benziger Web of Life Book, 1971, pp. 38-39 EEC #B150

Palmer, Candida, "Plants that Eat Animals;" Ranger Rick, November, 1977, pp. 26-27

Credit

Drawing: Cecelia Zych

Notes To Myself

Make a Fossil

Curriculum Topic
EARTH SCIENCE

Environmental Topic
ECOSYSTEMS, ENERGY-RESOURCES

Skills
Gaining information

Subject
Science

Grade Level(s)
3-5

Site
Classroom, school ground

Author
Arthur C. Braun, Jr.
Antoinette R. Giovannitti

Objective

The student will be able to:

1. create a leaf print in clay.
2. state the relationship between formation of a fossil and the leaf print.
3. explain in simple terms, the formation of fossil fuels.

To The Teacher

Carbon is a key element in all living materials. It exists in the atmosphere primarily as carbon dioxide, in which form it is incorporated directly into plant protoplasm in the process of photosynthesis. Organic carbon is obtained by animals through various stages of digestion, respiration, assimilation and decomposition. It can re-enter the atmosphere as CO_2 through respiration. Or, if it remains in the plant or animal, it ultimately passes into dead organic material from which it can return to the atmosphere by oxidation or decomposition.

In some animals, carbon becomes tied up in hard parts such as shells or bones. At one period of geologic time, carbon became "locked" in large plant deposits which were buried and slowly converted to coal and petroleum. These deposits remained in this form for millions of years until discovered and released by mankind in combustion to serve energy needs. These carbon fuels are known as fossil fuels.

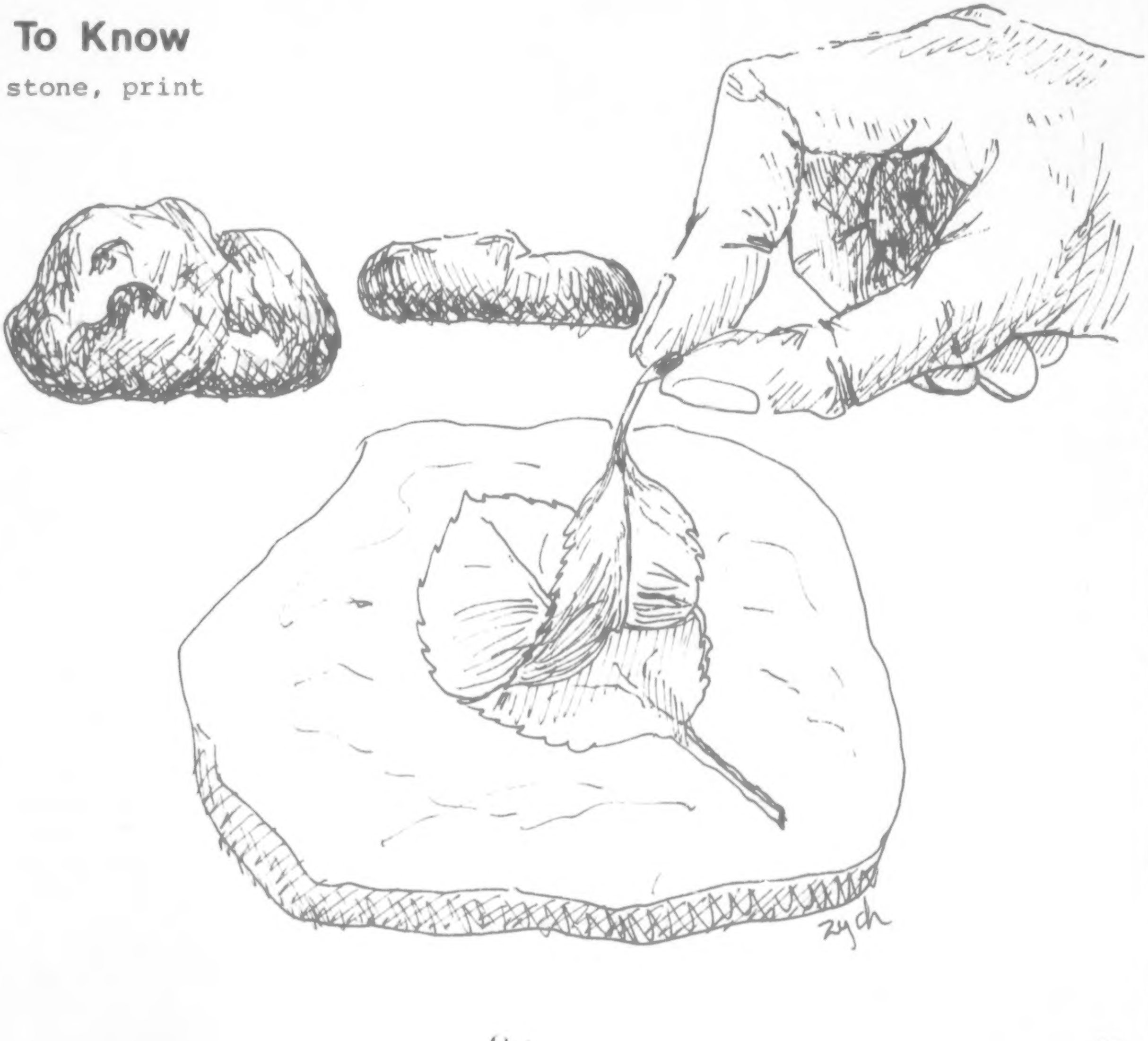
Scientists who investigate layers of soil and rock often uncover interesting fossil prints of leaves. This information has provided them with facts about the environment at various time periods. This activity will show the students how a leaf can produce a fossil print. The "print" is not a true fossil, but it is similar in appearance to leaf prints left in soft coal, shale and other sedimentary rocks. Then students will consider the process which resulted in the formation of large quantities of fossil fuel.

Before You Begin

1. Small leaf and a blindfold for each student.
2. Oil based clay (water based clay or ceramic clay may be used if there is a kiln or oven available).
3. A large stone for each student.
4. Prepare one hunk of clay for each student to use in the classroom.

Words To Know

fossil, stone, print



ACTIVITY

1. Take the class outside and have each student find a small leaf and large stone.

2. In the classroom, blindfold students and have them feel the stone that they found. This will increase their sensitivity to shape, size and texture. Discuss how it feels (cold, smooth, rough, crevices). Collect the stones. Mix them up.

3. Remove the blindfolds. Give a hunk of clay to each student.

4. Pass out a different stone to each student. Have them feel the stone and mold the clay into a similar shape as the stone. (The finished product will be the same size and shape.)

5. The children will press their leaves, vein side down, into the surface of the clay.
6. Removing the leaf, they will observe the clear print that remains.
7. Place on window ledge to dry.
8. Possible discussions might include:
   a. Explain to the students the natural process of imprint formation. What are these imprints called? (fossils)
   b. Discuss how energy was originally captured from the sun by green plants and then converted to fossil fuels. (See To The Teacher) Explain why we call coal a fossil fuel.
   c. Discuss the ways that scientists use fossils. (See To The Teacher) How do we use fossil fuels?
   d. Consider the length of time it takes to make a fossil (millions of years). Discuss with students the implications for human use of fossil fuels.

Credit

"Make a Fossil", Project Learning Tree, 1977, p 146.

Drawing: Cecelia Zych

Notes To Myself

Measuring Plant Growth

Curriculum Topic
METRIC SYSTEM

Environmental Topic
ECOSYSTEMS

Skills
Collecting data, infering
from data measurement

Subject
Science

Grade Level(s)
3-5

Site
Classroom

Author
Cyndi Walsh

Objective

The student will be able to:

1. list control and variables in scientific method
2. interpret metric data
3. observe the plant's need for light to carry on photosynthesis

To The Teacher

The following activity will reinforce essential experimental skills in scientific method, working with controls and variables, record taking and use of data. Since all of the measurement will be done in metrics, it will also increase the student's understanding of this system.

Metric application can be varied according to sophistication of the students. For example; A plant that grows 5 mm in one week can be
recorded as 5 mm or .5 cm (centimeters)
or .05 dm (decimenters)
or .005 m (meters)

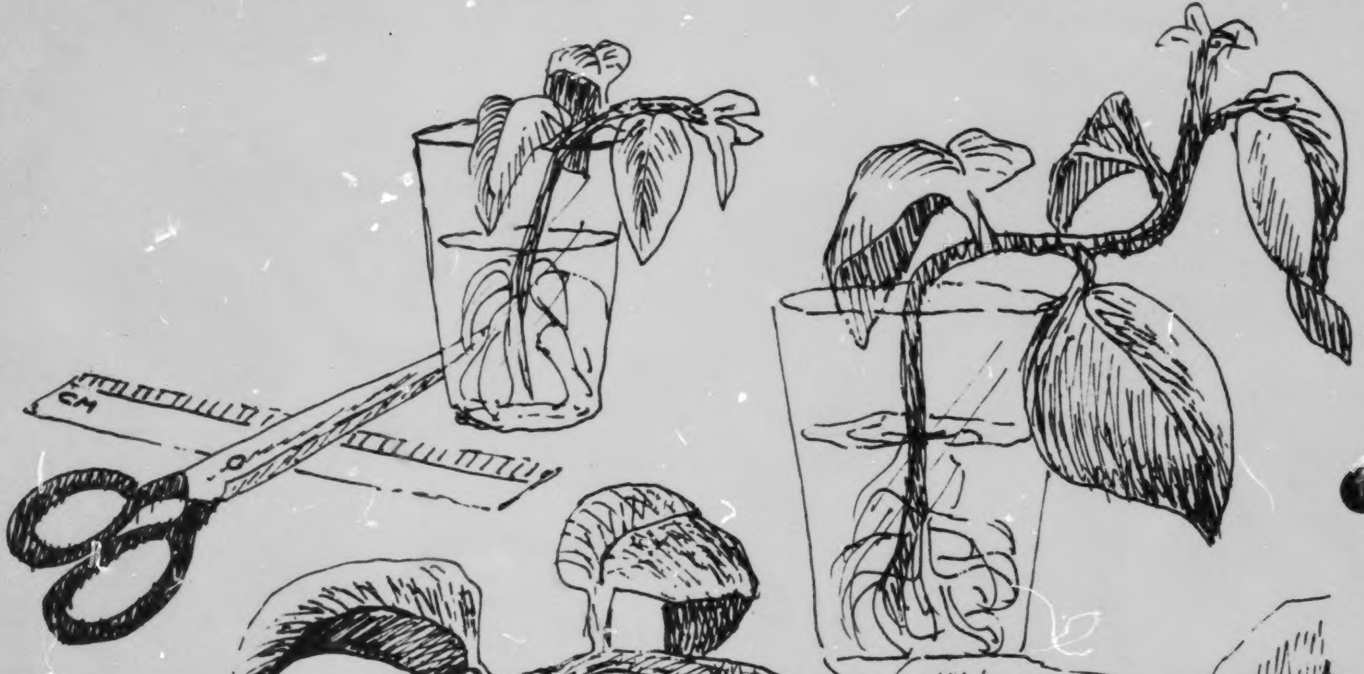
For younger students the concept of measuring by their own arbitrary system could lead to the discussion of a need for standard measurement. For example, every student may pick a measuring tool of their own to measure a plant. The plant may be 5 paper clips high or 1 pencil high or 2 crayons high, etc. After discussion of the non-standard measurement, the class can agree upon a standard such as a paper clip, and then eventually the centimeter.

Before You Begin

Materials: jars, soil, water, string, metric rulers, construction paper, copies of the Student Page, a plant - such as a coleus or philadendron

Words To Know

variable control, milliliter (ml), centimeter (cm)



ACTIVITY

1. Divide the class into small groups. Give each group a transparent container (the same if possible). Mark the container by number, letter, or name.

2. Have each group measure out the same amount of water (perhaps 250 milliliters) It is important to stress the need for control in each aspect of the experiment.

3. Have each group take a cutting from the plant (be sure each group gets an end cutting). Each plant should have the same amount of leaves. Have the groups decide the number of good leaves to be left on the plant cutting. Discuss the function of the leaves as energy collectors.

4. Place the cutting in a transparent container. (The teacher should follow the exact same steps to make a control.)

5. Measure each cutting using a string. Have the students record the total length of the cutting by using the string and placing it on a ruler. The length and width of all the leaves should also be recorded. The measurement should be done in the predetermined manner.

6. Have each group place their containers in the same spot near a window. When the roots are about 5 cm long have each group plant its cutting in identical soil and jar. Plan how much water each plant is to receive each day. (Use standard measurement....milliliters)

7. After the cuttings are rooted similarly in the same size and kind of container with the same soil, and plans are made to water the same amount each day, you are ready to conduct the experiment to test the need of sunlight.

8. Have each group select a location for its plant. Place the control in a dark area. Explain the concept of scientific controls.

9. Have students record information in predetermined manner on their record sheets each week. Discuss progress of each plant compared to the control. What are the light needs of their type of plant?

10. Draw some conclusions. What variables have they tested? (Intensity of light) Discuss how this could be better tested? (Perhaps a camera light meter) What factors influenced the results? (Heat, forgetting to water, drafts, noise, a plant placed in a traffic pattern, talking to plants.)

Related Activities

1. Discuss how this need for light results in competition. (Tall trees form a canopy over smaller, low lying plants in a dense wooded area.)

2. Brainstorm experiments to demonstrate overcrowding and competition of plant life.

3. Use package garden seeds to set up a scientific observation station of plant life experiments.

4. Find out how a forest ranger, gardener, farmer, lumberman manage their lands to avoid overcrowding.

5. Ask students to set up other experiments with a better control.

5. Ask student to set up other experiments with a better control. Presentation of their experiments should include explanation of control and variables. Suggested variables: fertilizer, amount of water, different soils, different amounts of attention, (talking to plants).

6. (For older students) Research the use of lie detectors on plant life. Find out why the experiments conducted do not follow the scientific method.

Credit

Plants in the Classroom, EEC #A26.

"The World Around You", Environmental Education Packet, Garden Club of America, New York, EEC #26.

Drawing: Cecelia Zych

Notes To Myself

99

STUDENT PAGE

PLANT CUTTING

RECORD WHEN IN WATER

	Beginning	End Week 1	Week 2	Week 3	Week 4
1. Length of Cutting					
2. Number of Leaves					
3. Width of Leaves					
4. Length of Leaves					
5. Number of Roots Developed					
6. Length of Roots Developed					

PLANT CUTTING

RECORD WHEN IN SOIL

	Initial	End Wk. 1	Wk. 2	Wk. 3	Wk. 4
1. Location of Plant (next to window, under table, etc)					
2. Length of Cutting above soil					
3. Number of Leaves					
4. Width of Leaves					
5. Length of Leaves					
6. Length of entire plant from top of leaf to end of longest root (optional since the plant will have to be removed from the soil and replanted.					

Lorax Letters

Curriculum Topic

LANGUAGE ARTS

Environmental Topic

ECOSYSTEMS

Skills

Reading, writing, analyzing, identifying alternatives

Subject

Language Arts

Grade Level(s)

3-5

Site

Classroom

Author

Karen Ann Hayward

Objective

The student will be able to:

1. list objects around them that are man-made,
2. differentiate among the basic raw materials that are required to produce these man-made objects,
3. identify those man-made materials which they live without.

To The Teacher

America is one of the wealthiest nations in the world. It's citizens no longer fight for survival or worry about finding enough food. Instead, we grow overweight on needless junk foods and spend millions of dollars on hobbies and recreation. Clothing has become, for many women, an elaborate extravagance instead of the basic necessity it once was. Americans love to spend money on one-job appliances such as crepe makers, popcorn poppers and electric dicers to name a few. We over-do every aspect of our daily lives. Some packaging is a perfect example of having "over-done" it. An example of over packaging is presented to us daily by our fast food restaurants. Advertising is in the business of selling us things we don't need.

The Lorax by Dr. Seuss is a story about a civilization which allowed things they didn't need (THNEEDS) to damage their quality of life. The book provides a medium for children to learn about the concept of things we don't need (THNEEDS) as well as an opportunity to enjoy excellent childrens' literature.

The games and toys we develop for our children teaches, trains and reinforces the concept of a THNEED. Without THNEEDS,our economy would surely collapse. When the students go home to find THNEEDS, have them first look at what they themselves bought or things that were bought for them.

Another approach to the book is through endangered species. Species of animals can disappear naturally but it is a long process as is evolution. People can accelerate the process of extinction through:

1. alteration of the land (loss of habitat)
2. over-hunting

The Passaenger Pigeon could easily be related to any of The Lorax's characters such as the Brown Bar-ba-loots, Swomee Swans and Humming Fish all of which vanished in the story due to a loss of habitat. Man assisted in the extinction of the Passenger Pigeon by destroying its habitat and food supply. As man cleared land he chopped down beech, maple, and oak trees which supplied the birds with their major food source, acorn and beech nuts. The pigeons' migration patterns were not easily moved to other areas of more food. Also, unlike other birds who lay many eggs in a nest, a Passenger Pigeon lays only one egg per nesting.

Before You Begin

Materials: a collection of man-made objects that we think we need, but could easily do without.

Preparation: several copies of The Lorax by Dr. Seuss; Random House, New York, 1971.

Words To Know

THNEEDS: material, man-made objects that we think we need but could easily do without.

Lorax: a shortish, oldish, brownish and mossy representative for the Truffula Trees, Brown Bar-ba-loots, Swomee Swans and Humming Fish.

Once-Ler: represents man and seems to speak for our industrial society, its values and goals.

ACTIVITY

1. Either read to the students or have the students read, The Lorax by Dr. Suess.

2. Discuss with the students what a THNEED is (a man-made object that we think we need but could easily do without).

3. Ask the students to find 5 THNEEDS in their classroom.

4. As a homework asisgnment have students find 5 THNEEDS in their home and 5 THNEEDS that belong to them personally.

Example:

Home	Personal
Electric blender	Plastic lawnmower
Electric broom	Squirt gun

5. Categorize the THNEEDS:

ELECTRICAL	PLASTIC	PAPER
(specific purpose appliances)		
popcorn popper	knives	plates
crepe maker	spoons	tableclothes
bun warmer	styrofoam cups	paper dish
electric toothbrush		clothes

6. Discuss with the students why we do not really need some of the listed THNEEDS.

7. What resources are used to make these THNEEDS? (Plastic from petroleum, paper from trees)

8. Refer to the "Cycles" activity in this book.

Related Activities

1. Have the students pretend to be an endangered species and write a letter to a human.

2. Have students write a continuation to The Lorax.

Resources

Hart, Jane, Environmental Education in Children's Literature, Environmental Education Center-A Program of Area Cooperative Education Services.

Miller, Tyler G. Jr., Living in the Environment Concepts, Problems and Alternatives, Wadsworth Publishing Company, Inc., 1975, pp. 162-164.

Wray, Phobe, Vanishing Wildlife, Endangered Species Productions, Inc. 1974, EEC # 725.2.

Credit

Jane Hart, Environmental Education in Children's Literature, Environmental Education Center-A Program of Area Cooperative Education Services.

Greater Than, Less Than

Curriculum Topic
ECOSYSTEMS

Environmental Topic
MATH

Skills
Gaining information, using information for a purpose, classifying, concluding, identifying consequences of alternatives

Subject
Math

Grade Level(s)
3-5

Site
Outdoors

Author
Arthur C. Braun, Jr.
Antoinette R. Giovannitti

Objective

The student will be able to:

1. make comparisons among natural objects using the terms greater than and less than.

To The Teacher

Our environment consists of a mosaic of different plants and animals of higher and lower forms of life. Each are interdependent upon the other in order to exist and to flourish. All life has a common biochemical basis which provides the conditions for life processes to operate with the greatest efficiency. It is mankind's duty not to disturb this life process in any way for the consequences can be fatal to us.

In this activity students will become aware of this interdependence of nature. (e.g. Fallen twigs and leaves from a tree decay nearby and are absorbed as nutrients back into the ground. Here the nutrients resupply the tree with necessary natural plant food, as well as, becoming a supporting system for lower life forms.)

Nature can be used to teach the math concept of greater than (>) and less than (<) to the students. (e.g. Trees, shrubs, twigs, leaves, stones, rocks - use these examples in terms of numbers present.)

Before You Begin

Materials: leaves, twigs, 3" x 5" oaktag (2 per child), felt markers or crayons.

Preparation: Each child will be given two cards and will put the symbol and words greater than (>) and less than (<) on them.

Caution: Return natural objects to original locale when activity is terminated.

Words To Know

greater than (>), less than (<), interdependence, ecology, environment, similarities, comparisons, differences, decay

Cartoon by Al Johns

"I DON'T WANT TO PRY, STEVE, BUT HOW ARE THINGS GOING WITH YOU, ETHEL AND THE KIDS?"

Conservation News 6-15-75

ACTIVITY

1. Before going outdoors, distribute crayons or felt markers and two oaktag cards to each student. Have them write "greater than (>)" on one card; repeat process using "less than"(<).

2. Take students outdoors. Have them scour the area for three very small twigs or leaves, and two large twigs or leaves. Ask them to remember where they found them so that the articles may be returned to original locations. All students are to return to a predetermined check-point once they have located their objects.

3. Ask them to arrange objects into two sets, so that each set is greater than (>) the one on its right, and less than (<) the one on its left. (e.g. Three twigs > two twigs) You may wish to point out that the open end of the symbol always faces or is on the same side of the larger number.

4. Place the "greater than" card in between the two sets so that it will make a true number sentence.

5. Repeat the process so that each set is less than (<) the one on its right, and greater than (>) the one on its left. (e.g. two leaves < three leaves.) You may wish to point out that the closed end of the symbol always faces or is on the same side of the smaller number.

6. Again place the proper card between the two sets (less than <) so that it will make a true number sentence.

7. Have students combine into groups of three or four and independently repeat the process randomly using different numbers of objects in each group. Ask them to raise their hands when groups is ready to be checked.

8. After the math activity, ask the children the following questions:

   a. What do you think we should do with the twigs and leaves we collected? (throw out/return)

   b. What do you think is the better suggestion? Why?

   c. If we throw out the twig in a trash container, what happens to it? (burned or buried in landfill)

   d. What would happen to it if we place it back where we got it? (decays - provides nutrients for the shrubs and trees and lower forms of life. Because plants are able to grow they replenish our air with oxygen, and therefore we are able to live and survive. We are dependent upon those twigs and leaves to live and to keep the life processes operating.)

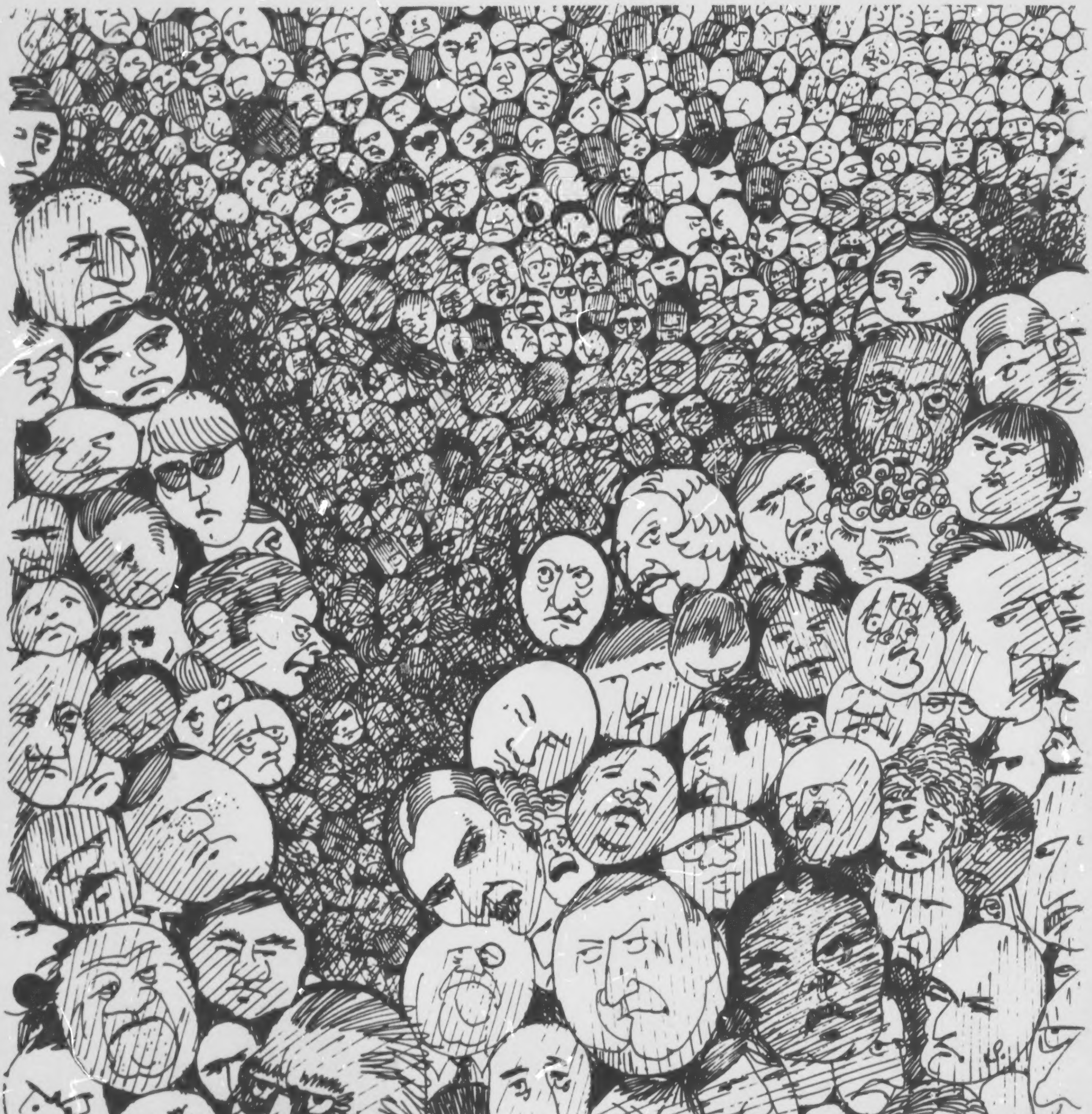
   e. Have children place twigs and leaves back in their place of origin.

Credit

Project Learning Tree, Math Exercise, #60, p. 98, 1977.

Southwick, Charles H., Ecology and the Quality of Our Environment,
Van Nostrand Reinhold Company, 1972.

POPULATION



POPULATION

ACTIVITY TITLE .... PAGE NUMBER

ROBIN POPULATION 101
POPULATION DISTRIBUTION 106
POPULATION IN A FISHTANK 110
JAMESTOWN'S ENVIRONMENT 116
PURPLE MARTIN HOUSES 120
A PLACE UNDER THE SUN 124
POPULATION GROWTH 126
BUILDING A RAFT 129

POPULATION

"To get land's fruit in quantity
Takes jolts of labor more
Hence food will grow like one, two, three...
While numbers grow like one, two, four..."

--Anon., "A Song of Malthus: A Ballad on Diminishing Returns"

The chorus of voices singing songs of Malthus in recent years has swelled to such numbers that almost all Americans have been convinced that over population is a serious world problem. In our affluent society, however, it is difficult to grasp the full dimensions of world population policy, and many Americans who are absolutely certain the world is overpopulated have only the vaguest understanding of the basic principles of population dynamics. More startling is the fact that most people probably do not realize that the human population is subject to the same principles of growth and control that animal and plant populations are.

Any population is characterized at a particular time by the number of individuals in it. The number of individuals divided by the space occupied by the population gives the population density. Population density is a rough but not exact guide to how "crowded" a population is. For example, the density statistic for New York State indicates how crowded, on the average, New York State is, but it includes in that average the solitude of Adirondack Park and the human hordes of New York City.

Population numbers and population density are, of course, far from constant. Individual organisms are constantly being born, dying, and moving to or away from the area being considered. These "vital statistics" are expressed as rates rather than as simple numbers. For instance, if a population of ten thousand people has three hundred births in the year 1979, its birth rate is thirty per thousand people per year. If in the same year its death rate is sixteen per thousand per year, the intrinsic rate of growth of the population, its birth rate minus its death rate, is fourteen per thousand per year. The actual rate at which the population grows may be different, because the net effect of migration in and out of the population must be considered as well.

The key point to remember about rates of growth is that they are in fact rates. Consider our sample population, and suppose that immigration (movement into a population) and emigration (movement out of a population) just balance each other. At a growth rate of 14 per thousand per year, a population of 1,000 individuals would add 14 new members; a population of two thousand would add 28. The population does not add the same number of individuals each year but a particular fraction of the total--1.4% in this case. A population that maintains such a constant rate of growth will have a characteristic doubling time. For instance, our population growing at 1.4% per year will double, no matter what its original size, in fifty years. This is the essence of geometric growth that Malthus found so alarming--the bigger a population gets the greater the number of individuals each year, even though the rate of growth per thousand stays the same.

Left to their own devices under the best possible conditions, all populations would grow geometrically. In the real world, of course, this does not happen, else all living things would be buried under blankets of whichever species succeeded in maintaining geometric growth. The key is that growth rates do not remain constant; they are instead density-dependent. In nature, as population become more crowded, their birth rate tends to drop as their death rate rises, until eventually an equilibrium population size is reached at which birth and death rates approximately balance each other. The growth rate is then essentially zero. This equilibrium position is the maximum sustainable number for the population, given environmental growth restraints such as predators, competitors, food, and space. It is called carrying capacity.

Did we say that species never sustain continued geometric growth in the real world? That isn't quite accurate. There is one species that has succeeded, through a long period of time, in maintaining almost constant geometric growth. That species, of course, is Homo sapiens.

Has humanity somehow managed to escape the natural limitations which bind all other species? Most ecologists and demographers think not. Instead, humankind has been able to use its intelligence and its technology to constantly push back the limits. The fact that modifications to the natural ecosystem have allowed for the sustenance of more and more people on our planet does not imply that there is no ultimate limit to growth. A simple graph of human numbers against time shows a steady and accelerating growth. But a more careful graph shows population growth taking place in three surges each ending in a period of stabilization and then another surge. Paul Ehrlich links each surge with a particular advance in human society. He calls them the cultural, agricultural, and industrial-medical revolutions. More significant perhaps than the revolutions themselves is the fact that without them human populations would have continued to be more or less stable. The plateaus reached were, in fact, the carrying capacities for the given level of social development. Humanity cannot assume that a fourth revolution of equivalent magnitude will occur and allow it to push past its limits once more. If in fact no such revolution is forthcoming, the built-in momentum of the present population explosion could lead to at least a modest version of the Malthusian nightmare.

Some people believe that the nightmare already haunts our waking hours. When fifteen thousand people in the world die each day from malnutrition, is that not a nightmare despite the fact that birth rates remain high enough to prevent the dramatic population collapse Malthus had predicted? Population scholars point to another salient question regarding human population growth: even if growth can be continued indefinitely, what effect will it have on the quality of the lives lived by our multitudinous progeny? There is no need to belabor the obvious effects of overpopulation--the starvation, the squalid living conditions, the poverty and unemployment which occur when there are too many people and too limited an economic base. It is important, however, to become aware of some of the more subtle manifestations of overpopulation, in developed as well as less-developed countries.

People discuss the energy crisis. Yet if there were fewer people demanding the world's energy the supplies would appear more ample. People complain that the land is being despoiled. But if population were not increasing there would be less need to develop our dwindling supplies of untouched land. Pollution, disease, high prices and wars may not be direct results of population pressure but the role that a too large, too dense or too rapidly expanding population plays in each of those problems is too often ignored. And as more and more people become more and more crowded, dependence upon mammoth and impersonalized systems to supply [illegible]tably becomes greater. Production to individual specification becomes more and more difficult. Freedom of action becomes increasingly limited as acts which once would influence only the individual performing them have greater and greater influence in other peoples' lives. The end result of overpopulation is a decrease in individuality, freedom, and other humanistic values. If humanity so chooses, it can overwhelm the earth with its numbers. But it will only be an illusory humanness which remains.

-Steve Gold

P. A. Samuelson, Economics

Robin Population

Curriculum Topic

CONNECTICUT

Environmental Topic

POPULATION

Skills

Computing, problem solving skills

Subject

Social Studies

Grade Level(s)

3,4

Site

Classroom

Author

Betsy Giovine

Objective

The student will be able to:

1. identify the robin as Connecticut's state bird,
2. compute the number of robins found in one backyard at the end of a five year period.
3. define the meaning of population and of the term, "population explosion."

To The Teacher

Overpopulation is one major cause of environmental problems. When there is rapid population growth within a species, the needs for maintaining that species often exceed available resources. Environmental disturbances ensue. A population study of the robin may be incorporated into a lesson on the state bird of Connecticut to demonstrate the concept of overpopulation.

The robin is a good bird to study because it is an easily recognizable bird, familiar to many children.

Before You Begin

Materials: Large picture of a robin, scrap paper for each student's calculations, copies of the robin growth chart (Student Page)

Preparation: Copy chart onto blackboard or prepare a transparency of the chart for demonstration purposes.

Words To Know

robin, offspring, population

Bill O'Malley

"YOU'RE LATE!"

Conservation News 7-1-76

ACTIVITY

Part I - Motivational Discussion

1. Display picture of a robin.

2. Ask if anyone can name the bird.

3. Tell the class that not only is this a picture of a robin, but it is also a picture of the state bird of Connecticut.

4. Ask where the class might have seen a robin before (backyard, schoolyard).

5. Explain that a pair of robins usually produces two broods. Each brood is, on the average, four baby robins per year.

6. If there are two broods of four baby robins, how many baby robins are there altogether (assuming all baby robins survive and there are no deaths)? (Eight)

7. Ask if any student knows the meaning of the word "population". (Define, if necessary.)

Part II - Chart Work

1. Distribute copies of the population chart and scrap paper for math work.

2. Explain the chart and the information already provided on it.

3. Reminders for filling in chart:
   a. Put the "number of robins at end of season" into the following year's "number of robins at beginning of season."
   b. Each mate of 2 robins produces 8 offspring.
   c. To get "number at end of season" add "number at beginning of season" to "number of young produced."

4. Fill in the demonstration chart with answers supplied from the class.

ROBINS	1st year	2nd year	3rd year	4th year	5th year
No. at beginning of season	2 robins	10	50	250	1,250
No. of pairs at beginning of season	1 pair	5	25	125	625
No. of young born (8/pair)	8 young	40	200	1,000	5,000
Total No. at end of season	10 robins	50	250	1,250	6,250

Part III - Discussion Questions

1. How many robins would be in someone's yard at the end of 5 years? (6,250)

2. How do you think the robins would feel (crowded, cramped, etc.)

3. Would their food supply satisfy them all?

4. How does nature provide against situations like this?

5. What did we assume in this activity? (All the robins lived)

6. How would you feel if people multiplied as robins do? How would you feel if 6,250 people were living in the amount of space that you and your family live in now? Remember all 6,250 people must use the same amount of food, electricity, oil, gasoline, water, and air that you and your family use now.

7. Explain the term "population explosion" (When the rate of population growth shows a sudden increase which cannot be equalled by an increase in supplies of food, water, fuel, etc. to go around.)

Related Activities

1. We know there will never be 6,250 robins in someone's backyard at one time. Use library resources to learn what keeps this population down. (predators, starvation, diseases, accidents, bad weather, pesticides)

2. Draw an illustration of the robin growth chart or illustrate your idea of a population explosion.

Resources

Pruett, Susan & Carol Harrington, Environment and Population: A Manual of Learning Activities for Elementary Grades; Environment and Population Manual, P.O. Box 62, Rochester, MI, 48063, 1975 EEC #146.

Notes To Myself

STUDENT PAGE

ROBINS	1st year	2nd year	3rd year	4th year	5th year
No. at beginning of season	2 robins	10			
No. of pairs at beginning of season	1 pairs	5			
No. of young born (8/pair)	8 young	40			
Total No. at end of season	10 robins	50			

Population Distribution

Curriculum Topic

CONNECTICUT
GEOGRAPHY

Environmental Topic

POPULATION

Skills

Map-reading
Basic skills
Organizing data

Subject

Social Studies

Grade Level(s)

3 and 4

Site

Classroom

Author

Betsy Giovine

Objective

The student will be able to:

1) recognize and identify the state boundaries of Connecticut as depicted on a map

2) identify the cities where population concentration is evident

To The Teacher

"Mankind is not uniformly distributed over the face of the Earth...Population density is the number of individuals per unit area...Some rough estimates (people per square mile) of population densities in the 1960's are:

Earth (land area)	65
United States	55
Japan	700
Tokyo	20,000
New York City	25,000
Manhattan	75,000

"In contrast, before the arrival of Europeans in the continental United States, its population density was about 0.33 people per square mile; the density rose to 5 people per square mile by about 1800. Of course, one must be cautious when describing densities in terms of people per square mile as it is human tendency to gather in clusters. Although the U.S. may today have about 55 people per square mile on the average, there are, of course, many square miles that have no people. Furthermore, within any given square mile, people will not ordinarily be uniformly distributed." The attached map gives a graphic representation of the patchy distribution of the human population in Connecticut.

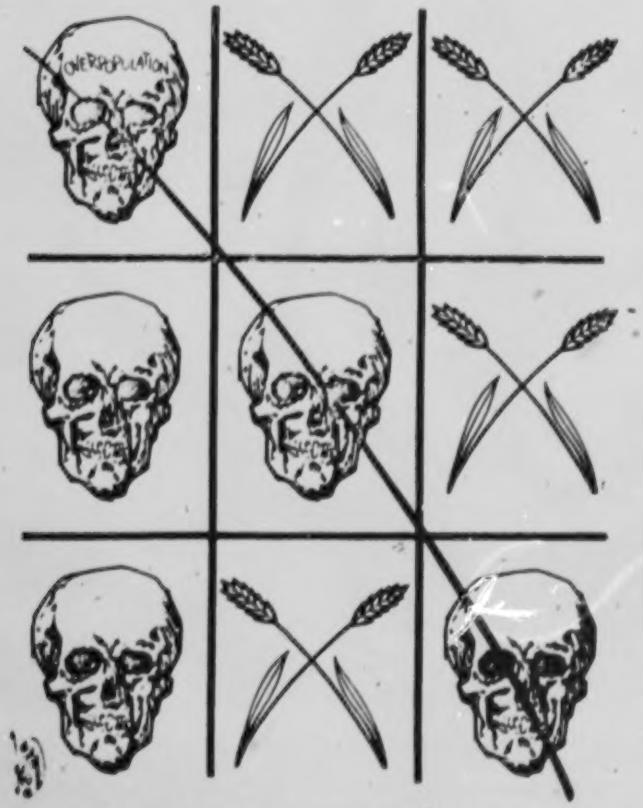
This patchy distribution has mixed environmental effects. On the one hand, it is a necessity because even distribution would not allow for enough open space. Among other difficulties would arise that of growing enough food to supply this evenly-distributed population. On the other hand, the "oldest of all demographic trends," urbanization, accentuates environmental pollution of all kinds and damages our physical and psychological well-being. Yet these dense agglomerations of people provide us with much of our technology, individual freedom and culture.

Population patterns are the result of environmental and social forces. Often, they reflect the position of natural resources and pre-existing cultural and technological advantages. The dense clusters of population in those parts of Connecticut along river valleys, served by good harbors, and/or close to New York City are representative examples of the kinds of collective decisions people across the United States and throughout the world make when deciding where to live.

Before You Begin

Materials: Copies of Population Distribution, 1970, provided at the end of this activity

Preparation: The class should be prepared with fundamental knowledge of the geography of Connecticut (harbors, rivers, boundaries, cities, outline of the state) in order for the activity to be of merit.



Cartoon by Tom Darcy, Newsday, 1st Prize 1975 Population Cartoon Awards

ACTIVITY

1. Pass out copies of Population Distribution 1970.

2. Allow time for students to examine the map. Explain its key.

3. Ask the class to consider reasons why the population is distributed as it is (location of harbors, rivers, railroads, highways, major industries, sources of energy, etc.)

4. Discussion questions:

   a. Why are the dots not more evenly distributed? Why are they clustered?

   b. Which are the most and least-densely populated counties?

   c. Why do you think Litchfield county is so sparsely populated?

   d. Why do you think there is so heavy a concentration of people in the southwest corner of the state?

   e. By drawing a circle around the areas where large cities are most likely to be found, locate Hartford, New Haven, and Bridgeport and label each circle with the name of the appropriate city.

   f. Put a star on the map to show the county you live in.

   g. Draw in important rivers.

   h. Label the state's boundaries. Remember---states may be bordered by water as well as other land areas.

Related Activities

1. Have students find the present population in their towns by visiting their town halls. They should ask for a population distribution map of their towns to see if they can determine why people in the areas indicated live where they do.

2. After studying the geography of the United States or of other areas of the world, students can try to determine, without the aid of a population distribution map, where clusters of people are settled. Use an atlas to check your assumptions.

Credit

EEC Newsletter, 1977, New Haven, Vol. 1, No. 5, p. 6 (map)

Ehrlich, Paul and Anne, Population, Resources, Environment, W.H. Freeman & Co. , 1970, pp. 34, 37 (quoted in "To the Teacher")

Steve Gold, contributor

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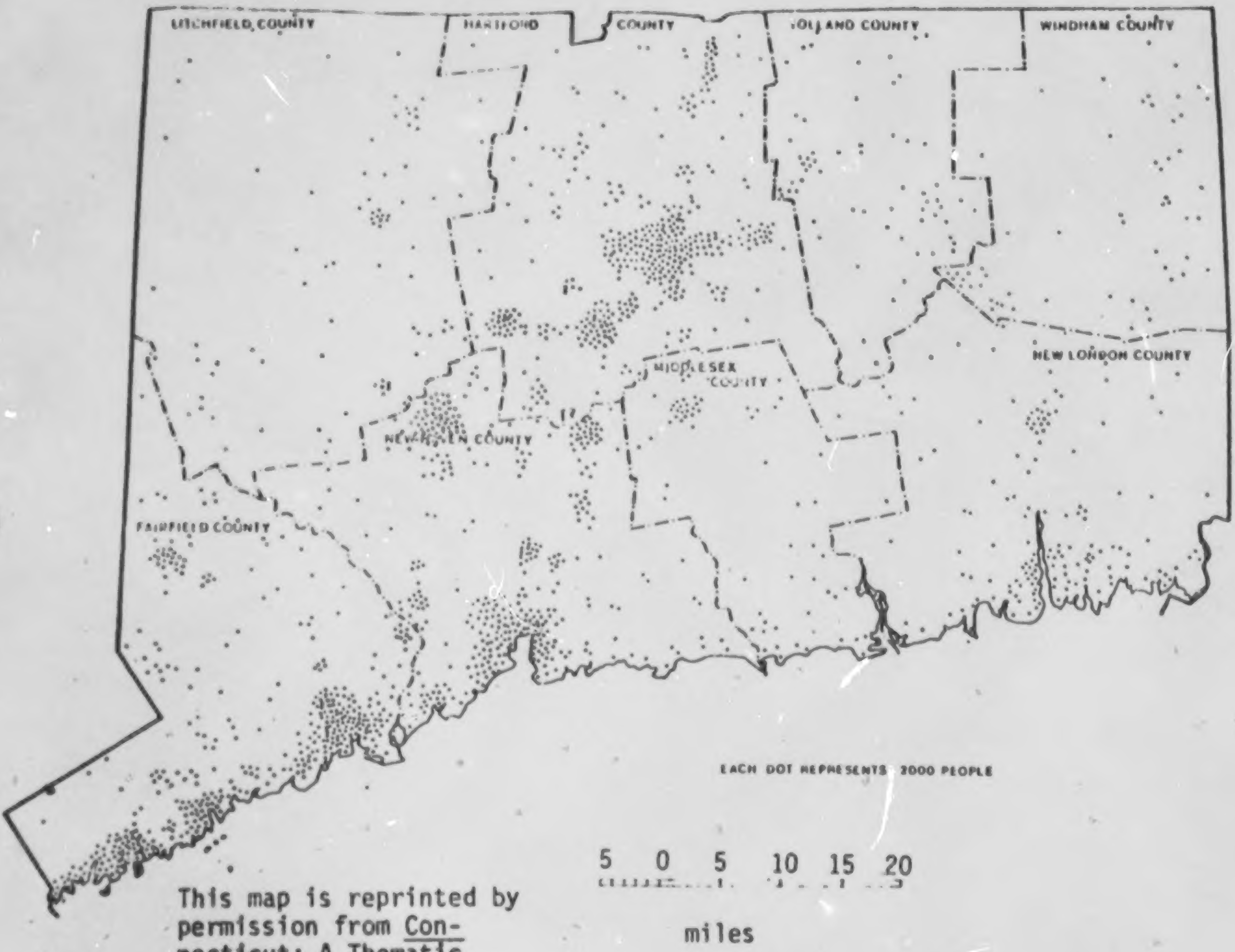
Population Distribution 1970


LITCHFIELD COUNTY
HARTFORD COUNTY
TOLLAND COUNTY
WINDHAM COUNTY
NEW LONDON COUNTY
MIDDLESEX COUNTY
NEW HAVEN COUNTY
FAIRFIELD COUNTY
EACH DOT REPRESENTS 2000 PEOPLE
5 0 5 10 15 20
miles

This map is reprinted by permission from Connecticut: A Thematic Atlas by Allen R. Smith, Department of Geography, Central Connecticut State College.

Population in a Fishtank

Curriculum Topic

URBAN STUDIES
ECOLOGY

Environmental Topic

POPULATION

Skills

Observing, experimenting, using information for a purpose

Subject

Social Studies

Grade Level(s)

3-5

Site

Classroom

Author

Arthur C. Braun, Jr.

Antoinette R. Giovannitti

Objective

After completing the activity the students will be able to:

1. identify the impacts of crowding on a population.

To The Teacher

Given proper conditions, one housefly could give rise to a population which, in seven short generations, would number more than six trillion individuals! Such ridiculous growth-rate does not, of course, occur in nature, else we would rapidly find ourselves wading--no, swimming--in houseflies. The houseflies are kept in check by environmental constraints. These limits, such as predation, disease, food availability, amount of suitable habitat, etc., together establish a carrying capacity for each population of every species. As populations approach this carrying capacity, their mortality tends to increase, while natality often decreases. This density-dependent population control system is what keeps natural systems in balance. When the control system goes away, as in the case of the deer on the Kaibab Plateau in Arizona, catastrophic population crashes are likely to occur. There, predation had kept the deer population at about 4,000. In 1907, a bounty was placed on wolves, cougars and coyotes. The bounty effectively reduced the predation pressure until the deer population exploded. In 17 years it increased 25-fold. By 1925 the deer had so badly overgrazed the plateau that 60% of this enormous herd died from lack of food within two winters. The population eventually stabilized at about 10,000 deer.

Human population, thanks to their ability to modify the environment, have been able to push back natural carrying capacities and support larger and larger populations. But crowding, while it has not yet led to massive density-dependent mortality, has led to inconvenience, at least, in rich lands and misery in poor nations. Overcrowding in America's cities, for example, leads to strains and limitations in the delivery of such services as police protection, fire fighting, and education. It also increases pollution and waste-disposal problems. Lastly, there are psycholical responses to crowding - stress, tension, aggression - which occur in people and animals and can lead to violent social disruption. Although 85% of Americans would like to raise their children away from cities, the megalopolis continues to grow. Every census since 1870 reveals an increase in the total proportion of population living in urban areas. This growth parallels the country's industrial growth. Between 1890 and 1900, labor-saving agricultural technology and the expansion of industry inspired a major migration of people in the U.S. from agricultural areas to urban centers. By 1900, 40% of the population were living in urban areas of 2,500 or more and over 60% of the economically active population were working outside the field of agriculture.

On the whole, the least densely populated parts of the country experienced the most rapid relative growth between 1870 and 1960. Absolute population increases, however, were greatest in the middle Atlantic, Great Lakes, and Southeast regions. The majority of the population continues to cluster in areas east of the Mississippi, but to a lesser degree than a century ago. New England and the regions of the Middle Altantic, Great Lakes and Southeast contained 85.5% of the nation's population in 1870, 74% in 1910, 71% in 1950, a little over 69% in 19 1960 and, in 1966, 68.5%. Meanwhile, the West, Southwest, and Mountain regions experienced the greatest relative expansion. Their share of the national population increased rapidly.

In this activity, the student will observe the consequences of overcrowding by comparing two situations in which population density is different. The species under study is the goldfish, which like many other animal species, may defend territories (space guarded against other members of the same species). The territorial system tends to break down under highly crowded conditions. In these conditions, the emergence of an aggressive "bully" among the fish is more likely, although it is possible in any tank.

Goldfish will not spawn until they are two years old and three to four inches long. It is extremely difficult to breed them, as carefully controlled conditions are necessary for success. Newly hatched fish have a yolk sac on their undersides which provide them with nutrition for a short time after emergence from the egg.

The fish are herbivorous and not terribly selective, eating many types of aquatic plants. A notable exception is the so-called banana plant, which can grow on the surface of the water or at the bottom of the tank, and is seen decorating many aquaria while remaining uneaten.

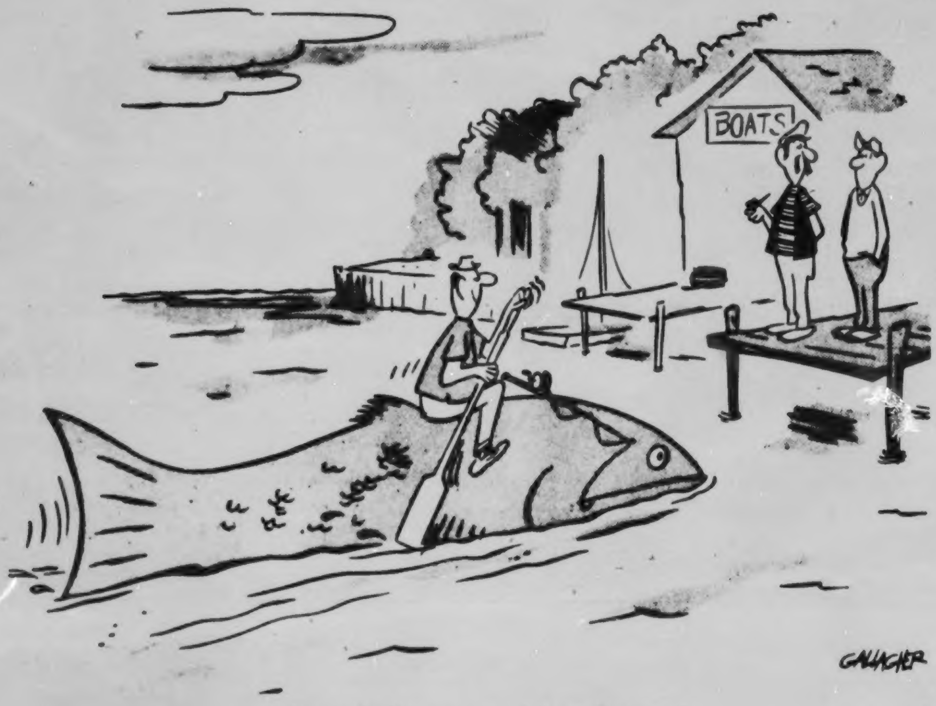
Before You Begin

Materials: 2 aquaria (2-quart jar and a 10 gallon tank), 8 goldfish (medium sized), fish food, plants, gravel, air pump and water filter (optional: see Caution), tap water, plastic or soup bowl, two sealable plastic bags

Caution:
1. 10 gallon tank water must be changed every 3-4 weeks if tank does not have an air pump and water filter.
2. Add water to small aquarium as it evaporates.
3. Buy banana plant for aquarium.
4. Any water that is to be added to aquarium must stand uncovered for at least 2 days so that it will dechlorinate.

Words To Know

aquarium (pl. aquaria), gravel, variables, aggressiveness, chlorine, food chain, breeding, evaporate, sequence, spawn, stabilize, interaction, territories, increase, decrease, acidic, survival, alkaline, nutrients



"Don't believe a word he tells you."

Conservation News

ACTIVITY

1. Set up the two (2) aquaria exactly alike with four (4) fish in each according to the procedure below:

    a. Wash the two aquaria thoroughly with plain tap water.

    b. Put the gravel in the bottom of the tanks and put a bowl on top of the gravel.

    c. Pour tap water into the bowl slowly, allowing it to overflow. In this manner, fill the tank without disturbing the gravel, until the tank is 3/4 filled.

    d. Take out the bowl and arrange your plants.

    e. Using your hand as a protection against disturbance of the gravel, place it beneath a slow stream of tap water to completely fill the aquarium and let stand for 2 days to dissipate the chlorine.

    f. Keeping the fish in their original water, separate them and put in 2 plastic bags. Leave plenty of room for air in the bag.

    g. Float the plastic bags on top of the water in the aquariums for 1/2 hour. Then release the fish. (This is to allow the temperature to equilibrate).

2. For several weeks make daily observations of the two aquaria. Note the number of fish present, aggressiveness expressed in their behavior patterns, water conditions, etc.

3. Disucssion Questions:

    a. What physical differences are apparent in the two aquaria? (The water in the two-quart jar will appear much dirtier. The fish produce about the same amount of fecal matter in each tank, but since there is so much less water in the two-quart container, the concentration of waste materials is much higher. The decomposition of this waste is accomplished by bacteria, releasing the nutrients contained in the feces into the water. The enrichment of the water causes a bloom of algae. Many of these algae die, creating even more decaying organic matter. The decay process uses large amounts of oxygen, and soon the biological oxygen demand in the mini-ecosystem is out of balance with the ecosystem's ability to supply it. This process, known as cultural eutrophication, makes the water foul to look at and to smell and may very well kill the fish by suffocating them.

    b. Are the fish in the large aquarium more aggressive than those in the smaller one? (No, they are more aggressive in the small container because just like people, each fish has a personality of its own. Usually, there is one fish that is considered the "bully" of the group. Because of the small space available there is not much room to move around in. In the large aquarium, the other fish are able to seek out their "own" spaces or territories as a retreat from the fish we shall call the "bully". In the small aquarium, the passive fish have no room to establish separate territory and must simply avoid contact with the bully if they are not to be continually antagonized by him.

c. Are there more fish in the small aquarium after a month? Why?
(No, in all probability, because of the congested situation and resultant polluted conditions, and because of the presence of a "bully", depending upon how aggressive it is, it will comsume all the food in the tank and, thereby, cause its co-habitants to die.)

d. How have the water conditions in the aquarium changed?
(The pH (acidity) factor of the water is important. Because of evaporation, one must add water to the small container as needed. The minerals of the original water remain, however, while the new water adds more. The long range effect is a higher pH or hardness which eventually can kill the fish.)

e. Has the condition of plants changed in the aquariua?
(Fish will not eat the banana plant, but they will use the water spread plant for food.)

f. Discuss the food chain as it is established in the aquarium.
(We put food with high mineral content into the water. The fish eat these minerals and microorganisms and excrete by-products which are food for the plants. The plants, in turn, give off oxygen, so that the fish can survive. The cycle begins again.

g. What happens when the plants are removed? Why?
(Since plants give off oxygen, they are are necessary to an aquarium that does not have an air pump and water filter. Without them, the fish will die. Plants are also needed by the fish for security in providing places to hide when the aggressive fish becomes antagonist. Growth of plants in the small jar is limited by the lack of room for growth.

Related Activities

1. Using aquaria of the same size, you may wish to explore other variables, i.e. changing plant life, food, snails.

Resources

Bates, Marston,"Crowded People", in The American Population Debate, ed., D. Callahan, Anchor Books, 1971, pp. 77-83, EEC #C49.

Kormondy, E. J., Concepts of Ecology, Prentice-Hall, 1969, pp. 95-97, 181-182, EEC #C69.

Odum, E. P., Fundamentals of Ecology; W. B. Saunders, 1971, see index for information on eutrophication and carrying capacity.

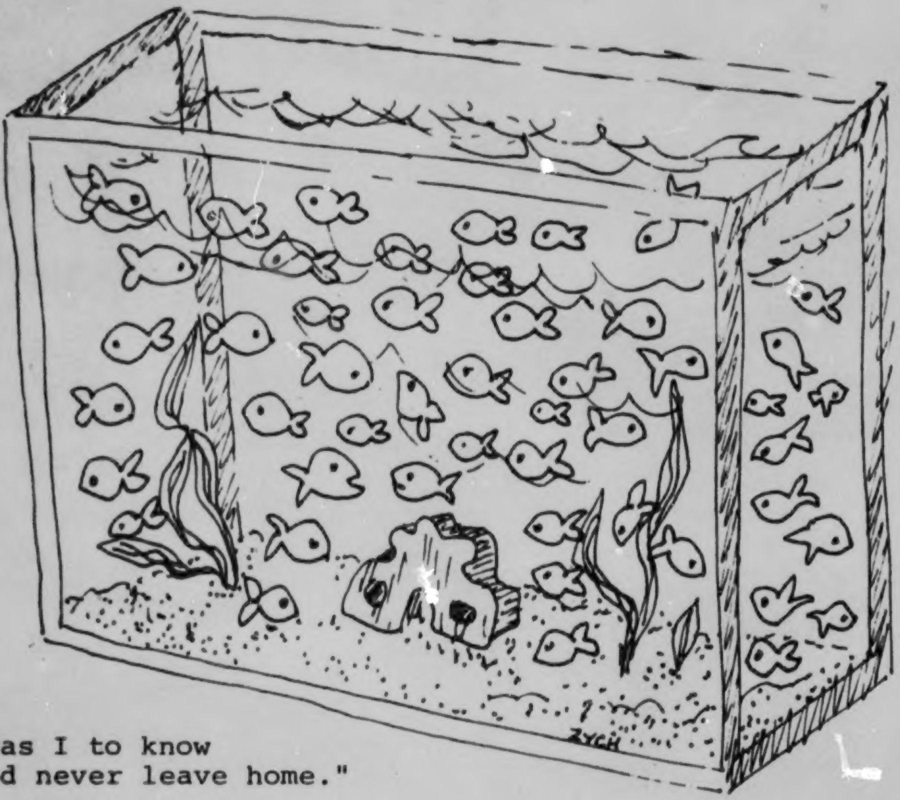
Sale, Larry L. and Ernest W. Lee, Environmental Education in the Elementary School, Holt, Rhinehart and Winston, Inc. 1972.

Credit

Kathy Page, "Goldfish Population Study", Stapp and Cox, Middle Elementary Vol. 3 p. 30-31.

Antionette Giovanitti, Steve Gold, contributors.

Drawing: Cecelia Zych



"How was I to know
they'd never leave home."

Notes To Myself

Jamestown's Environment

Curriculum Topic

COLONIAL PERIOD

Environmental Topic

POPULATION - PEOPLE

Skills

Problem-solving skills, group skills

Subject

Social Studies

Grade Level(s)

5

Site

Classroom

Author

Betsy Giovine

Objective

The students will be able to:

1. identify the difficulties which faced the early settlers in the colony of Jamestown.
2. demonstrate their knowledge of requirements for adjusting to an environment through group discussion.

To The Teacher

The colony of Jamestown is considered to be the first successful English colony in the New World. Although established in 1607, Jamestown did not grow into a prosperous colony rapidly. The first settlers had to overcome the hardships of a new, uncivilized area of land. Their adjustment was not easy, and many died before expectations were fulfilled.

There were two classes of people who established the colony: the tradesmen/laborers and the noble "gentlemen." (Gentlemen being those who did not work for a living, but rather lived off their money.) Since half were working and half were not, the colony suffered managerial problems as well as the problems that accompany adjusting to a new environment.

The first winter was severe and those who survived it owed their lives to John Smith. He organized the colony by setting up rules that required everyone to share the workload.

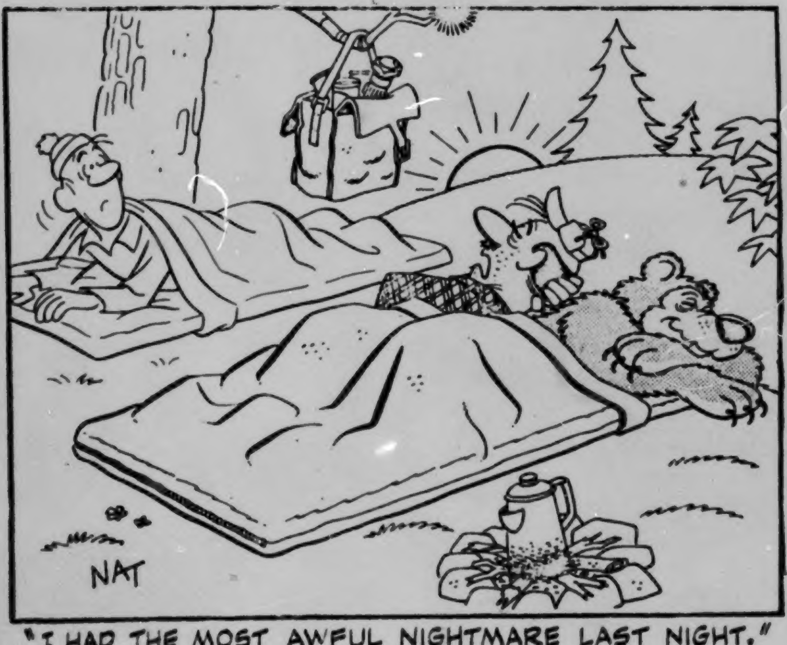
The environment that Jamestown encompassed was a peninsula beside a river surrounded by forests and swamps. During summers, disease emanated from mosquitoes in the swamps. The winters were also harsh with only sixty of the five hundred settlers surviving the winter of 1609. These settlers were expected to endure in an environment that was foreign to them.

Before You Begin

Materials: pencil, paper, map depicting area where Jamestown was founded, American History texts (optional), and ditto copies of discussion questions (see Activity Part II)

Words To Know

geography, noble gentlemen, environment, peninsula



"I HAD THE MOST AWFUL NIGHTMARE LAST NIGHT."

Conservation News 11-1-73

ACTIVITY

I. Motivational Discussion

A. Questions for undivided class

1. Ask how many students have gone camping.

2. What type of environment did they search for when choosing a campsite?

3. What difficulties occurred? List these on blackboard.

4. What is geography? (study of land areas)

5. Ask students to consider different land areas such as deserts, mountains, forests.

6. Begin a discussion concerning what it would be like to live in these areas. What are the advantages; the disadvantages?

7. Explain that geography is also climate: the change in seasons, the rainfall, the winds. Explain that geography had an effect on the colonists' efforts to settle in the New World.

8. Using a map, indicate where the colony of Jamestown was established. (on James River near Chesapeake Bay)

9. If textbooks are available, turn to passage regarding the Jamestown settlement. If textbooks are not available, refer to teacher background and give the class necessary information.

B. Procedure

1. Divide class in half.

2. Assign one person from each group to be scribe (secretary) to record group discussion.

3. Assign one person from each group to be group chairperson. This student is responsible for leading the discussion and providing a synopsis of the group's responses to the entire class.

4. Assign one group the following discussion topic: If you were a group of settlers coming to the New World in 1607 how would you adjust to the environment? (Instruct the scribe to take notes and the chairman to allow everyone equal time.)

5. Assign the other group the following discussion topic: If you were a group of settlers coming to the New World in 1978 (substitute applicable year) how would you adjust to the environment?

6. Inform students that they will be required to present their discussion to the other group so it is important to keep their thoughts organized.

7. Allow twenty minutes discussion time.

8. Circulate between groups giving feedback and stimulating discussion.

9. When twenty minutes have passed, ask for group reports. List on blackboard the points made by the two groups. Use different sections of the blackboard in order to show the comparisons. (Optional: the scribe from each group could have already done this if time is limited)

10. Discuss as a class the points made by both groups, and conclude by reminding students that mankind must learn to adjust and adapt to the environment.

II. Student Participation

A. Discussion section - the following questions, (ditto copies) are to guide the discussion within the small groups. These will be the basis for the culminating discussion:

1. How would your five senses react to the new environment?

What would you see?
What would you hear?
What would you smell?
What would you taste?
What would you feel?

2. How would you provide for the following: food, clothing, shelter?

3. If you were separated from the group of settlers, how would you survive by yourself?

4. What would be the most important thing you would need to survive?

B. Culmination Discussion - the following questions are to be teacher directed after the two groups have presented their points.

1. How are the two lists similar?

2. How are the two lists different?

3. How could you better both environments making them easier to inhabit?

4. Are people capable of changing the environment today? How?

Related Activities

This activity can be adapted to fit other areas which require human beings to deal with the natural environment (i.e. foreign countries, prehistoric times, the western frontier).

Resources

The World Book Encyclopedia

Coons, L., and B. Prater, Trails to Freedom in American History, 1965, Ginn and Company, pp 141-144.

Purple Martin Houses

Curriculum Topic

BIOLOGY

Environmental Topic

POPULATION - population of a species undergo dynamic changes.

Skills

Construction models

Subject

Science

Grade Level(s)

5

Site

Classroom or wood shop, outdoor nesting site

Author

Paul Sanderson

Objective

The student will be able to build a birdhouse suitable for attracting Purple Martins and increasing their population.

To The Teacher

Human populations can increase the population size of Purple Martins by supplying them with nesting sites in areas where depopulation of their species might otherwise occur. If nesting sites are available, Martins are amenable to living among human populations. From our point of view, Martins may be considered helpful for controlling the number of flying insects such as flies, mosquitoes, wasps and beetles. We are, therefore, helping ourselves by encouraging the continued existence of Purple Martins in a given area. Such encouragement is afforded by birdhouses simply constructed of wood by the aid of basic carpentry skills. This activity offers instructions for building houses for Purple Martins. Further information about the birds themselves is provided at the end of the activity.

Before You Begin

1. Familarize yourself with Purple Martin house design, construction and maintenance from information provided at the end of this activity. For additional information, see list of resources.

2. Select a design appropriate to the abilities of your students. Make xerox copies or blueprints of this design.

3. Locate several Purple Martin nesting sites: open woodlands, residential areas and agricultural land are compatible with their needs. You may need permission to use an area.

4. Find an area suitable to woodworking.

Materials: Durable wood (pine, redwood, cedar) galvanized steel nails/ screws, glue, hammer, drill and bits, saws, long poles (15 ft. - 20 ft.) rulers, pencils, paper, plans/blueprints.

Words To Know

birdhouse, Purple Martin, environment, population, flying insects

Resources

Brann, Donald, Birdhouses and Bird Feeders, Directions Simplified Inc. 1975.

Champion, Paul Birdhouses, Bruce, 1940.

Perry, L. Day and Frank Slepicka, Birdhouses, Bernett, 1955.

Peterson, Roger T., Field Guide to Birds, Houghton, Miffin Company, 1947.

Robbins, Bruum and Zim, Field Guide to Birds of North America, Golden Press.

Terres, John K., Songbirds in Your Garden, Thomas Y. Crowell Co, New York, 1953, pp. 78-79.

Additional Sourses:

The Connecticut Audubon Society, 2325 Burr Street, Fairfield, CT 06430, phone: 259-6305.

The National Wildlife Federation, 1412-16th Street, NW, Washington, DC 20036.

ACTIVITY

Explain to the class:

1. Some Purple Martin nesting sites have been altered or destroyed by humans, who have thereby discouraged these birds from nesting.

2. By building birdhouses, we can encourage Purple Martins to nest in and populate an area.

3. By increasing the Purple Martin population we are improving our own environment by decreasing through natural means, the number of flying insects. In doing so, we avoid the use of harmful pesticides.

4. Briefly outline the birdhouse construction procedure.

5. Build the Purple Martin houses.

6. When they are completed, place the birdhouses in the areas selected for them.

7. Later, discuss:

    A. In what ways do humans alter the environment and thereby, inadvertently discourage birds from nesting? (Houses, roads, factories, urbanization and development.)

    B. How can we encourage Purple Martin's to populate an area?

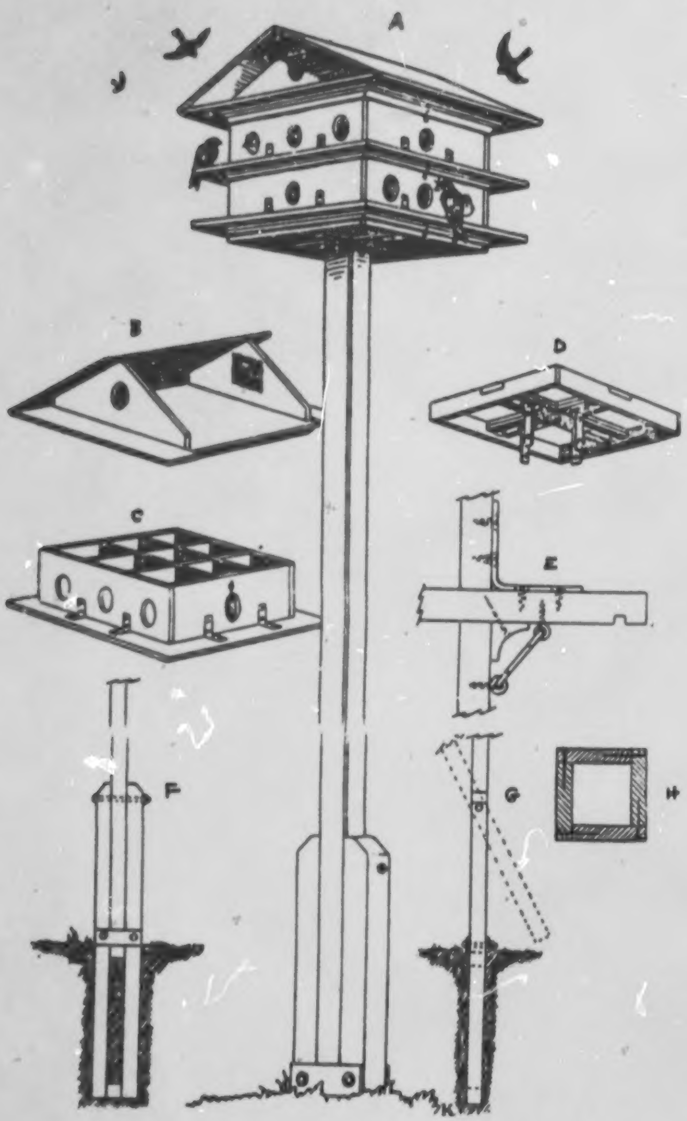
    C. What kind of environment is necessary to encourage and increase Purple Martin population? (Proper nesting sites, availability of insects for food.)

    D. How do Purple Martins improve the human environment? (By decreasing flying insect population. By decreasing the need for chemical pesticides.)

Related Activities

1. Revisit the nest sites to observe the birds that occupy the houses. Later return to clean and maintain the houses.

2. Visit a nature center to see what is done to attract birds to nest there.



BUILDING THE MARTIN HOUSE (*opposite page*). Sections, or floors levels, may be built and added separately to the martin house (*A*) as the bird colony grows. A central air shaft and elevated roof allow air to circulate within and to cool the house. A molding strip around the under side of the roof and under each floor section (see detail *E*) holds them in alignment. The sections are held together by hooks and screw eyes (*E*). Use ¾-inch pine or other soft wood for walls and floors; use ½-inch wood for the roof and the interior partitions.

Roof Detail B. Roof with one side removed. The 6 × 6-inch opening of the central air shaft which should be cut out of the center of the attic floor is not shown. A 1-inch-high shoulder on the roof supports allows air to pass up under the eaves and into the attic, which has a ventilation hole at each end that is screened to prevent birds from getting in. The roof is 29½ inches along the ridge top and 16 inches from peak to eaves level. The distance from outside to outside of the end ledges is 22½ inches.

Nesting Compartments, Detail C. Make outside dimensions of floor 26½ inches square. If you use one piece of wood for the floor, the metal angle irons shown will not be needed. Make each nest compartment 6 × 6 × 6 inches, inside measurements. Cut out the floor of the central chamber which is the central air shaft. Make outside dimensions of nesting compartment 20½ inches square, ¾ inch thick. Use ½-inch pine for walls of *inside* of each nesting compartment. Cut the 2½-inch entrance holes along a line 2¼ inches above the floor.

Foundation Frame Support, Detail D. This is the 20½-inch square foundation, 2½ inches high, for the bottom section. It has a center cross built of a double-thickness of ¾-inch oak boards, 2½ inches wide. Attach four heavy angle irons, bolted to the oak frame as shown, which can be spaced to bolt to a supporting post 4 × 4 or 6 × 6 inches square, or to a round pole.

Detail E of Porch. When porch extension, instead of being part of floor, is attached separately, fasten with angle irons. Attach molding trim and angle irons with screws, as shown.

Detail F of Pole Supports. The 8-foot-long supports 4 inches square are set 4 feet deep in the ground. A heavy bolt or section of pipe serves as a hinge (*G*) and the base of the pole is held locked by two hardwood blocks or iron plates bolted together.

Detail H of Pole. Cross section of a post 4 × 4 inches square, built of ⅞-inch hardwood. Supporting poles or posts for large martin houses should be 6 inches in diameter or 6 inches square.

A Place Under the Sun

Curriculum Topic

BIOLOGY

Environmental Topic

POPULATION-PEOPLE

Skills

Collecting and compiling,
infering from data,
graphing data

Subject

Science

Grade Level(s)

3-5

Site

Classroom

Author

Orah Elron

Objective

The student will be able to:

1. construct an hypothesis
2. design an experiment
3. make conclusions from a graph
4. infer that population growth is limited by space available.

To The Teacher

This is a very simple activity. Students plant different numbers of seeds in containers of equal sizes, and test the minimum space needed for healthy growth. This experiment should lead to a class discussion on population growth. Students will conclude that space is a limiting factor to population growth.

Before You Begin

Materials: Ask students to collect small yogurt containers (8 oz. size) and rinse well. Each child will need: one "flower pot" filled with soil. Make sure to punch a hole in the bottom of the container and place each one on a small plate so as to avoid dripping water. Teacher will provide bean seeds for the experiment. It is also important to find a place in the classroom to maintain this experiment for several weeks.

ACTIVITY

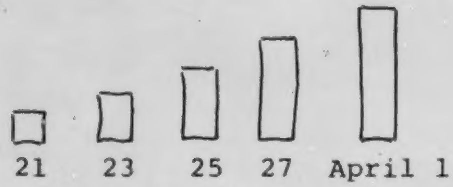
1. Analyze with the students the problem of how many plants can grow in a given space (the yogurt pot). Let each student suggest an hypothesis. Note their estimates with the date.

2. Students should soak beans in wet cotton for 24 hours before planting them in the wet soil of their pots.

3. In order to plant 1, 3, 5, 10, 15 seeds in the little pots, have 5 students work as a group, each group planting the 5 different number conditions. Each group labels their pots with group number, names and number of beans planted.

4. Each group will keep a record of the plant's development. It is advisable to measure every second day. Discuss with your class which would be preferred: to measure plant growth in inches or millimeters? (It will be easier by far to measure in the metric system adding each time a larger number of mm rather than working with fractions.)

5. In order to build a graphic representation of the growth, younger students can cut stripes of paper in the exact length of their measurement, and glue them one near the other on graph paper.



This way they will see the growth of their plant clearly. Older students might draw graphs.

6. After several days it will become apparent that a large number of seeds in one pot acts as a limit to the growth of individual plants. The students will observe that these plants grow slower and show signs of disturbance.

7. After at least a month class discussion can reveal the results of the experiment: what is the optimal number of plants in one pot? How can we transfer these conclusions to other population density problems?

Related Activities

1. Consider carrot or radish gorwth in gardens, the spacing of plants directly affects growth.

Resources

Halperin, Miryam, "From Seed to Seed", Matal Science in Elementary School, Tel-Aviv University Israel, 1973.

Words To Know

growth, population density

Population Growth

Curriculum Topic

ECOLOGY

Subject

Science

Environmental Topic

POPULATION - PEOPLE

Grade Level(s)

3 - 7

Site

Classroom

Skills

Model construction
Computing
Predicting
Graphing data

Author

Orah Elron

Objective

The student will be able to:

1. Guess the growth rate of a mouse population.
2. Construct a model to illustrate this growth rate.
3. Figure mathematically how many mice would be born in each generation, and how large the population would be after a half year using only addition and simple multiplication.
4. Construct a graph to show the rate of population growth (for higher grades only).

To The Teacher

Each group of organisms of the same kind living and reproducing in a particular area is called a population. Thus, we speak about the field mice population on "our farm," or the opposum population at the "Fairfield Sanctuary." The number of organisms in one population depends on the birth and death rate in that particular area. A population grows if more organisms are born and raised than die in the same area. Population growth, therefore, is highly dependent on birthrate and living conditions (available food, the natural enemies, the shelter, etc.) in a certain area. In nature, populations are often fairly constant, because under normal conditions, birth and death rates largely balance. In the lab (or under unusual conditions in nature), man can adjust several factors in this balance, and thus keep all the offspring of each pair of mice alive by supplying the necessary large quantities of food and avoiding any infectious diseases from outside the lab. In such a situation the population of mice in the lab will grow at a very fast rate.

Children and many adults will find it difficult to understand that scientists are alarmed about the growth rate of mankind. This activity will illustrate to young students how fast populations grow when the natural death rate is affected by medicine and technology.

Before You Begin

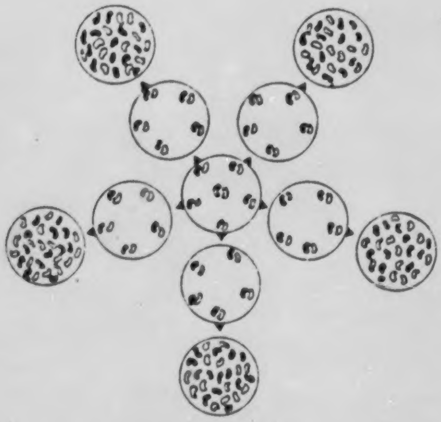
MATERIALS: two large bags of beans (dark and white), glue, several petri dishes or plastic lids for each group of students, pencils, paper, graph paper

Words To Know

population, growth rate, geometrical growth, generation

Related Activities

Try to find the limiting factors in nature which maintain the field mouse population at a balanced growth rate.



THREE-GENERATION MODEL OF MOUSE

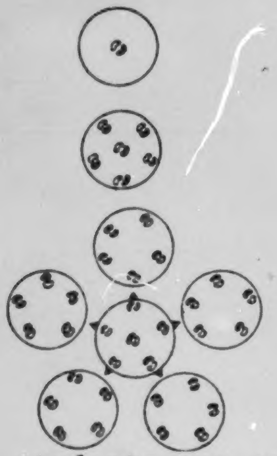
POPULATION

ACTIVITY

1. Start this activity by telling a story about a child who received a pair of white mice as a birthday gift, and was very happy when the first litter of 10 pink babies was born. Divide the class into small groups. Introduce the black and white beans as male and female baby mice, and have each small group of students illustrate the above situation by taking one white and one dark bean to represent the parent mice received by the little boy. What happened after several weeks? In another petri dish, glue beans representing the mice of the new litter.

2. The small student groups then guess (estimate) how many mice they would have in two months, in a year if their original pair had a new litter of 10 (5 females, 5 males) every month. The group will collect the estimates of individual members and then arrive at a group estimate.

3. Students then use the beans and lids to illustrate the hypothetical population growth:



A. The parents...

B. give birth to 10 mice.

C. After 2 months, (one month for maturation, one month to breed and bear young), each new pair of young mice has a litter.

4. If the students are ready for the more advanced math, consider that the original pair of mice has a new litter after the second and third months. In addition, these new generations each bear an additional litter. Beans representing these mice can be added to the model vertically (i.e., stack petri dishes, creating a tower of generations). Have students find a way to arrange the new generations vertically and horizontally. Glue each new generation on a new dish, or make chains of beans. Stop when the model becomes over-crowded.

Caution: After 4 generations, there are already more than 1500 mice!

5. After having built a 3-generation model (with or without the first pair having a new litter each month), the students will compute arithmetically the number of mice at this stage, after 4 months, 5 months, etc.

6. If the students are advanced in math, have them compute how many mice would originate from the one original pair after half a year. Make a graph or table showing the number of newborn mice each month.

Credit

Elron, Orah and Amelia Terkel, "Our Mice and Hamsters," Matal, (Science for Elementary School, Tel Aviv University), 1975

Building a Raft

Curriculum Topic
SHAPES THAT FLOAT

Environmental Topic
POPULATIONS

Skills
problem solving
experimenting

Subject
Science

Grade Level(s)
3

Site
stream, pond or large
artificial source of water

Author
Carla McGeeney

Objective

The students will be able to:

1. find objects in nature that will float
2. describe how insects disperse by rafting.

To The Teacher

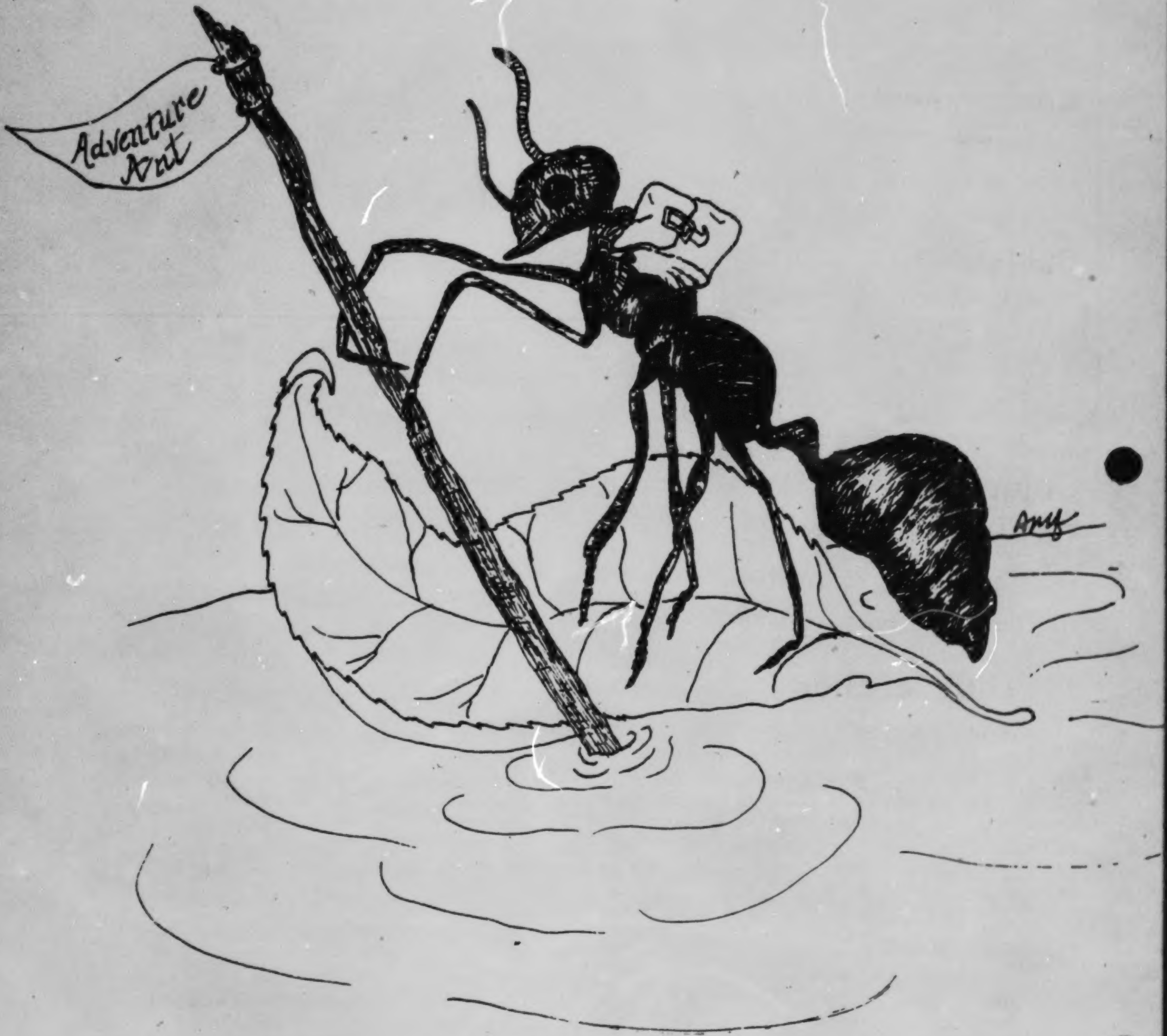
Dispersal is the movement of individuals from one location to another. It is important in all populations. Through dispersal, new populations begin and existing populations shift. A barrier such as a large body of water greatly influences dispersal mechanisms. To overcome the barrier, many small animals (primarily insects) catch a ride on a floating object in the water. This process of dispersal is called "rafting". Insects have been known to raft between islands separated by hundreds of miles.

Before You Begin

1. Gather as many insects as possible. It does not matter whether they are dead or alive. Flying insects must be dead or they will most likely not cooperate. Ants and small worms are also good subjects for experiment.
2. Set up a large tub of water if there is no stream or pond available.

Words To Know

dispersal, rafting


Adventure Ant
Amy

ACTIVITY

1. Discuss the concept of dispersal. Mention all kinds (walking, floating, flying, wind blown). Ask students to give an example of an organism which disperses in each of these ways.

2. Create a story of a hurricane on an island in the Caribbean: Insects are being blown everywhere. On the day after the hurricane, everything is calm. Insects can be seen floating in the water attached to objects of all sorts.

3. Assign each student to find a "bug" and a "raft". (A bug might be difficult to find. In this case, you might offer aid from your own supply.) Go to the tub of water (or stream) where students can demonstrate their "rafting" insect and describe its past and future.

4. Encourage students to collect all different types of rafts: leaves, twigs, paper.

5. Discuss which rafts were most successful as floating vessels and why.

Related Activities

Something else to do with the rafts:

Take the rafts to a stream and have a race. Start all rafts at the same time from a starting line. First raft to reach the premarked finish line wins.

Discussion questions:

1. What causes some rafts to go more slowly than others?

2. What causes some rafts to get caught in places where there are not solid obstacles?

3. What evidences are there that there are currents of different speeds in the stream?

Resources

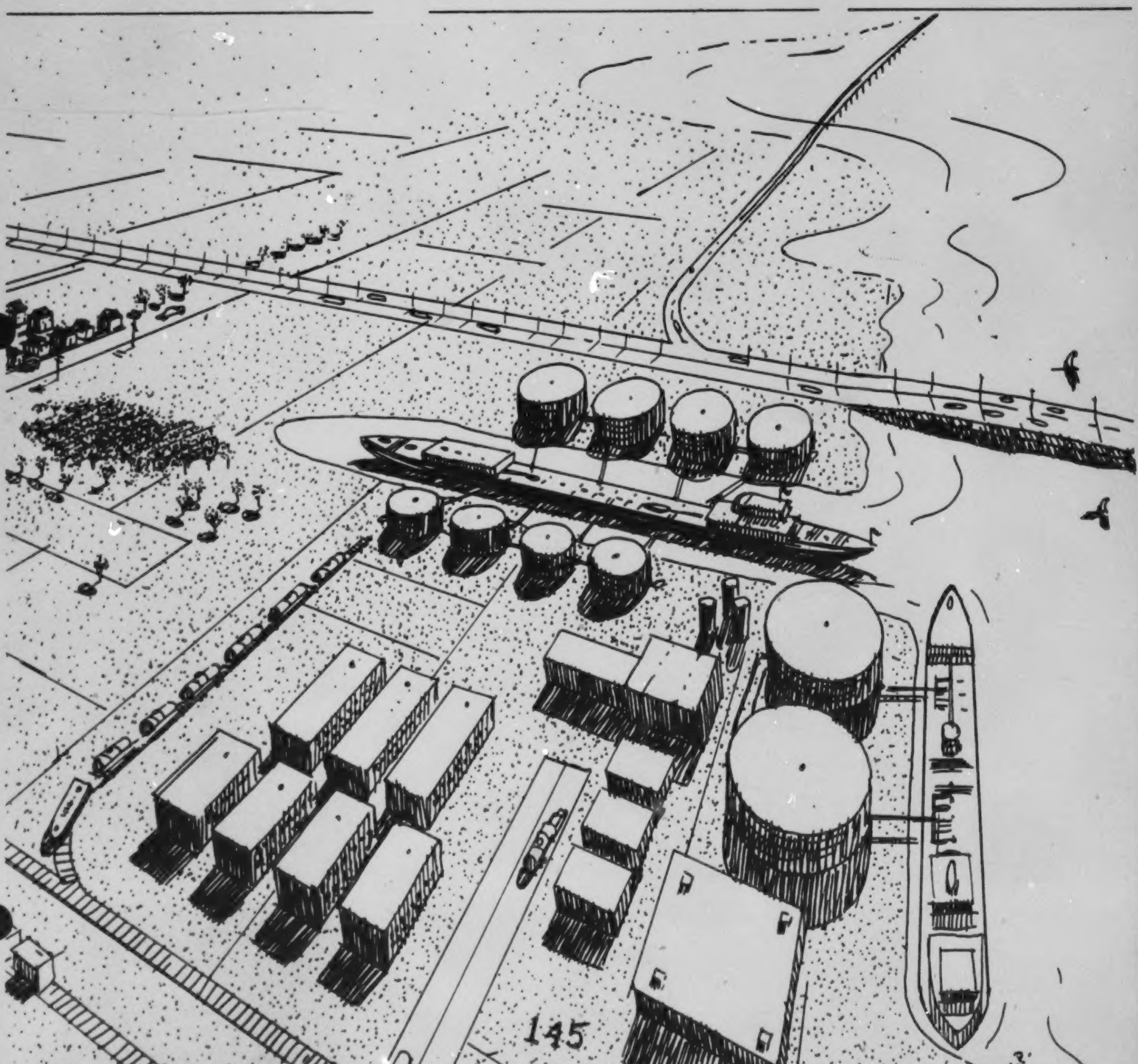
OBIS, Trial Edition Set I, Lawrence Hall of Science, University of California, 1975

Credit

Illustration, Ann-Marie M. Fleming

11

RESOURCES—ENERGY



RESOURCES - ENERGY

Activity Title	Page Number
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RESOURCES—ENERGY

"A material or energy form becomes a resource or continues as a resource because a technological innovation makes it available at a reasonable economic and/or environmental cost. The definition of a resource and the concept of an available, usable supply of a resource are therefore clsoely tied with changing technological capability and economics.

Resources can be separated into two categories:

- Non-renewable: a finite quantity of reserves that are made available to society as a function of available technology and capital investment. The depletion of non-renewable resources is dependent on the status of supply and demand for their use.
- Renewable: infinite reserves are available at specific rates to humanity depending upon specific locale; their availability as an energy resource is also a function of available technology and capital investment. The depletion of renewable resources, then, is dependent on the rate at which they are used.

Important distinctions between these two types of resources are summarized below:

NON-RENEWABLE RESOURCES	RENEWABLE RESOURCES
-exist in the earth in limited quantities that could conceivably be used up	-will be available so long as the earth ecosystem continues to function
-comprise forms of high quality energy that have been historically easier to collect and use	-tend to be of higher entropy and require more effort and energy input for collection and use
-constraints on availability arise from the necessary energy required to pump or dig them up	-available for use as fast as they are supplied by the natural system-for example, more wind or sunlight cannot be collected than passes through an area during a day

These distinctions provide a way to separate energy resources into renewable and non-renewable categories. This separation is exemplified in the following chart:

NON-RENEWABLE PRIMARY ENERGY RESOURCES	RENEWABLE PRIMARY ENERGY RESOURCES	
Petroleum	Solar	Radiant Solar Heat Photovoltaic Conversion
Natural Gas	Hydrological	Fresh Water Hydroelectric
Coal	Oceanographic	Tidal Temperature Gradient

Fissionable Materials	Geothermal	Steam Heat
	Wind	
	Life Forms	Human Photosynthesis Forests
	Recyclable Waste	

It is important to realize that the depletion of non-renewable resources is dependent on the quality and quantity of demands for which they are allocated, as well as their supply or rates of availability. Goods and services are the visible results of a resources delivery system, which is one way to describe the series of processes needed to change a raw resource into useful work or end use. Questions of allocation, however, also bring up the social aspects of equitable distribution of and access to both primary resources and the goods and services produced from them. These types of consideration make it necessary to examine the entire resource system in order to maintain a holistic mode of inquiry in an environmental education situation.

ENERGY

We hear the term "energy" constantly in the media. We know intuitively, that there is something "out there" (and internal, as well) that keeps our personal and societal process of activity and involvement going every day. We feel that energy is something definable, yet it is difficult to find a definition that is agreeable to everyone. For the purposes of environmental education, we feel the simplest definition is the most inclusive. Energy is a capacity to do work or bring about change. Energy, in this sense, includes not only naturally and humanly developed resources; but also materials, goods, and services which contain energy in many forms.

We live with the assumption that energy in its various forms is good for something, that it is essential in performing certain work-requiring tasks. Historically, Western industrialized civilization has attempted to dominate and control nature. What measure of success it has been able to effect has been due to this harnessing of energy for work. However, until recent events such as the Arab oil embargo, the findings of DDT in ocean life, and the popularization of the notion of space colonies, most people were not very concerned with how we obtain our energy, what it is used for, or what effects occur due to its use.

The list of energy/environmental issues that could be discussed is almost endless; the impact of technology, urbanization, land use and open space, conservation, and pollution of all kinds are simply those that are the most visible. However, all of these issues can be examined in terms of the relationships between energy and the work it performs. In environmental education, we can form a systemic framework for asking the right questions about energy, energy resources, and energy delivery in order to have a solid basis for personal decision-making and policy formation."

High School Energy/Environmental Education Training Model: Content Sourcebook
prepared by Far West Laboratory for Educational Research and Development, 1978
(Draft version)

Solar Cooking

Curriculum Topic
INDIANS - The Northeast Woodland Indian

Subject
Social Studies

Environmental Topic
ENERGY

Grade Level(s)
3 - 5

Skills
Constructing models
Experimenting

Site
Classroom

Author
Antoinette R. Giovannitti
Arthur C. Braun, Jr.

Objective

The child will be able to propose ways in which direct sunlight can meet some of our energy needs. The child will also explain how solar energy, by reflection, can be used to cook food.

To The Teacher

American Indians of the Northeast were farmers and hunters of the woodlands. They knew nothing of the tepee, but lived in wigwams. The Iroquois, who called themselves the people of the "Long House," built long huts (c. 100 feet) which had bunks and a central row of fireplaces.

The designs of shelter, divisions of labor, clothing, food and daily activities of these Indians were determined by the natural environments of the regions in which they lived.

The sun was necessary for his existence. Its energy was used to grow crops for man and food for local wildlife, or to prepare animals and plants for the long, hard winters.

Before You Begin

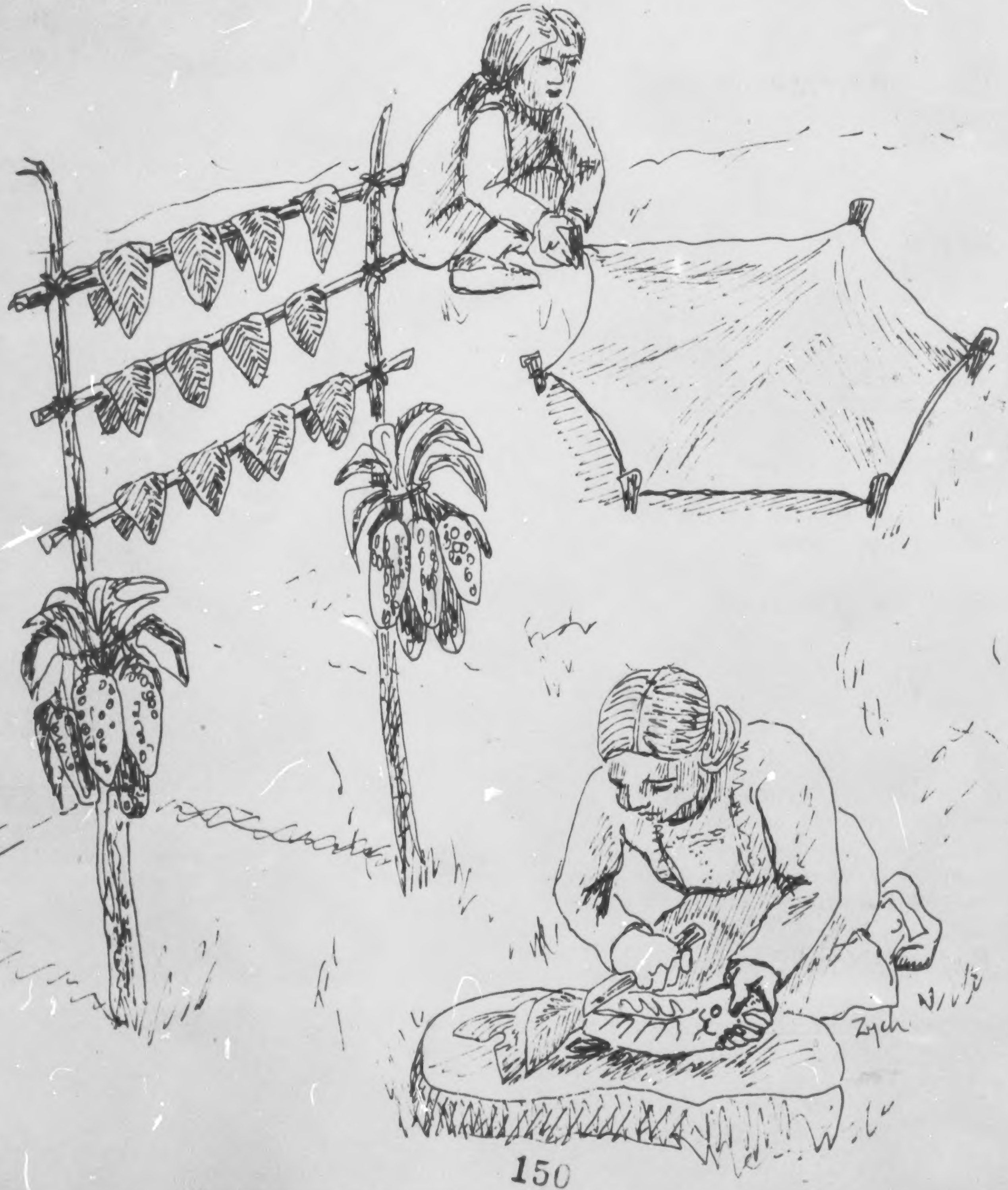
large paper clips, rubber cement, poster board, aluminum foil, black skillet, oven thermometer, food to cook (egg)

Cautions:

Advise children not to look directly into the sun because it can cause permanent damage to their eyes.

Words To Know

energy, reflector, natural environment, venison, preserve, edible, efficiency



ACTIVITY

1. After a lesson on Indians, ask the following questions:

   a) In what ways did the Indians cook their food? (central open fires)

   b) In what ways did they use the sun? (to preserve venison and other animal meats and fish)

   c) The native Indians used the sun as a means of cooking and heating. How might we, today, follow their example?

   d) How can we make a cooking device which will use the sun for energy?

2. Proceed to make a reflector for cooking food.

   a) Open the umbrella and measure its panels. Cut new panels out of poster board large enough to slightly overlap.

   b) Cover each poster with heavy-weight aluminum foil held by rubber cement. Use paper clips to mount the panels inside the open umbrella.

   c) Cut off the handle of the umbrella to the same length as the radius of the umbrella. (A string may be used to measure the diameter). Example: If the diameter of the umbrella is 30cm, then the length of the pointer should be 15cm (radius = $\frac{\text{diameter}}{2}$)

   d) Use the handle to direct the umbrella toward the sun. The hottest spot inside the umbrella is called the focal point.

   e) Put the skillet over the focal point. Fry an egg.

   f) To increase the efficiency of your solar cooker, in a paper plate the size of the pointer, cover the plate with foil and lay it over the pointer pushing it down to the center of the umbrella. This will help hold the panels in place.

3. Discussion question:

   a) How long did it take to cook the food?

   b) What are the advantages and disadvantages of using the sun's energy to cook food? (inconsistent source of heat)

   c) Can solar energy be used regularly to cook foods in the future? (Yes, necessity for new forms of energy and increased technological development in this area encourage the possibility of more widespread use of solar energy.)

   d) What are other uses of solar energy?

Credit

Oklahoma Energy Awareness Education, Oklahoma State Department of Education, 1977, EEC #1354

Shapiro, Irwin, The Golden Book of America, Golden Press, New York, 1961

Drawing: Cecelia Zych

"How Can I Get There?"

Curriculum Topic

CITIZENSHIP & CIVICS

Environmental Topic

ENERGY RESOURCES

Skills

Obtaining and organizing information, using information for a purpose

Subject

Social Science

Grade Level(s)

5

Site

Home, Classroom

Author

Orah Elron

Objective

The student will be able to:

1. gather and organize data,
2. generalize from data that forms of transportation other then the car are more energy efficient.

To The Teacher

One problem of energy use in our society is transportation. Most of American life is based on the private car. It is needed to reach a place of work, a school, recreation areas, etc. Although children often walk to school or take the school bus, they understnad their dependence upon the auto. In this activity children should research the public transportation available in their home area. They should consider the insufficiency of public transportation and understand the need for better ways to "travel" in the future. They also will compare the time restraints, the costs and other limits of public transportation as compared to the private car.

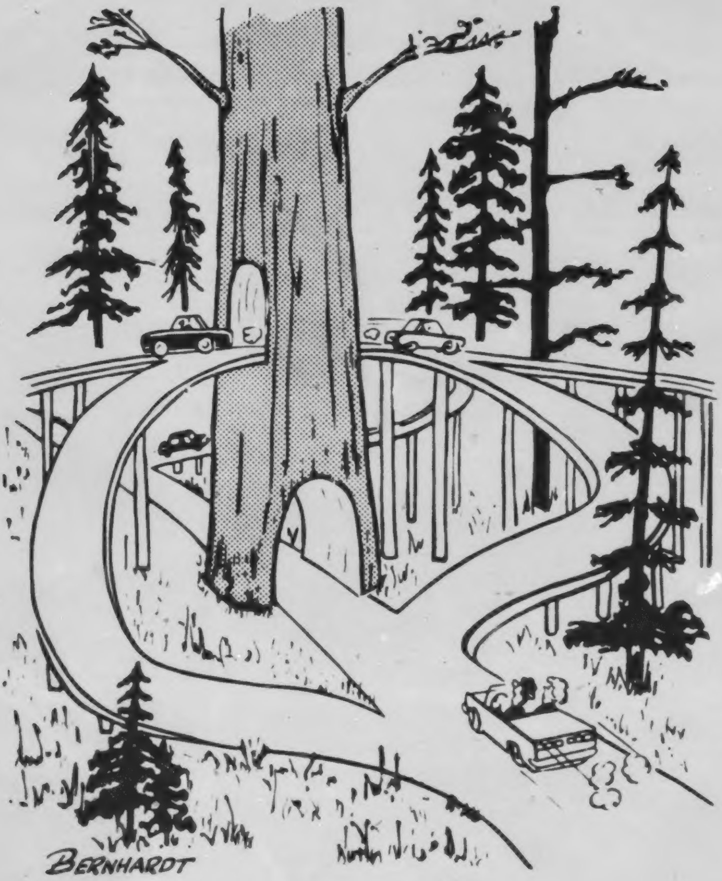
152

Before You Begin

Obtain detailed maps of your town and/or area for each student and also the telephone numbers of any public transportation agency (town hall would be able to give information and the bus company - Connecticut Transit in the New Haven area). You might wish to have the available information mailed to you in advance or let the children individually write for it.

Words To Know

public transportation, department of transportation, time table



"IT'S JUST NOT THE SAME AS IT WAS BACK IN '49."

Conservation News 9-1-76

ACTIVITY

1. Ask students to mark their homes on the map of the city (town, area) which you supply. It might be advisable to work in small groups of 4 so that 4 students can spread a map on a desk together.

2. Students will then mark a place of interest on the map which is:

   a. in center of town
   b. at the other end of town
   c. a distance of 10-15 miles away from their home.

3. Their task is to travel from their home to these three places without the use of a private car. They may use bus, train, bicycle or walk. Students will have to determine the route to travel, the time necessary and the expense.

4. Students can then measure on the town map the distance between several important places (with ruler and string) and figure how many miles they would have to travel by bus as compared to a car. How long will it take to reach their goal by bus as compared to a car?

5. Students should compare the expenses of car travel to a bus ticket - (It costs approximately 17¢ per mile to drive a car).

Related Activities

1. Students can transfer all available means of public transportation with colored crayon into town map and note the many places that are not reachable by public transportation.

2. Students might compare the situation in a small town with a metropolis (e.g. New York, Boston, San Francisco) that have most efficient public transportation systems.

3. Students can obtain information (from travel agencies) about public transportation service in other countries - railroads, buses.

Notes To Myself

Reducing Friction Saves Energy

Curriculum Topic

ENERGY

Environmental Topic

RESOURCES-ENERGY

Skills

Experimenting, concluding

Subject

Science

Grade Level(s)

4-5

Site

Classroom

Author

[redacted]

Objective

The student will be able to:

1. recognize some substances or items which help reduce friction,
2. relate that friction causes heat,
3. recognize that friction is sometimes useful and sometimes wasteful.

To The Teacher

Friction is the rubbing of two surfaces together or the resistance to relative motion between two surfaces in contact, resulting in heat energy. It has obvious benefits. Without it, we would not be able to move, contact or grip another substance. Think about walking, or turning a doorknob without it. Friction can be quite comical and frustrating. But in our mechanical, technological society, friction is often an enemy. It wears down machine parts and depletes us of useful energy. In a car it wears tires, decreases gas mileage, and eventually destroys even steel lubricated parts, such as pistons, cylinders and values.

There are substances and items that help reduce friction and conserve energy (e.g. oil and grease, bearings, rollers and wheels). This activity will explore how some of these help reduce friction.

ACTIVITY

1.a. Introduce the activity by having the students rub their hands together vigorously. Ask them what they felt. (heat) Explain that two surfaces rubbing against each other cause friction and friction causes heat.

b. Now have the students put a dab of hand lotion in the palm of one hand,and rub again. Did they feel as much heat? Why not? Explain that some substances reduce friction and reduce its heat.

2.a. Pass out the small wooden blocks. Wrap a sheet of sandpaper around the block and thumbtack it in place. Have the students rub two such blocks together. Does it cause friction? Heat?

b. Ask students what would help reduce this friction? Pass out the heavy grease and put a dab between the sandpaper blocks. Rub them again. What took place? Why?

3.a. Ask the students to attempt to grasp the point of the screwdriver between thumb and forefinger. Let the handle of the screwdriver hang freely. They should be able to do this.

b. Now dip the point of the screwdriver in the heavy motor oil and repeat the experiment. Can they grip the screwdriver now? What has happened?

4.a. Ask students to place two smooth-sided coffee can lids together. Do they slide very easily when pressed together?

b. Now place a dozen or so marbles between the lids (lid sides will hold the marbles on the lids). Repeat the experiment. Do the lids move more easily? Why? Explain that the marbles act as ball bearings helping the two surfaces move with less friction.

5.a. Fill the "sturdy" box with about 100 pounds of weight (less weight will also work). Ask several hearty students to slide it across the room. Have them describe their work. What made it hard? (weight and friction)

b. Using the pipes or dowels as rollers, move the box. Lift one side of the box and slide a roller under. Push forward and add another roller. Push forward. Try to keep at least 2 rollers under the box at all times. When one roller comes out from behind the box, move it to the front again and push. Be careful of fingers and toes. Did the rollers make the work easier? Why? (reduced friction, acts like a bearing)

6. Discussion Question:

   a. What causes friction?

   b. How did your hands feel? (hot)

   c. What helped reduce the friction? Heat? (hand lotion)

   d. How does oil or grease reduce friction? (makes things slippier) How do they help us conserve energy? (reducing the energy needed to do work)

   e. Where else do we use oil or grease? (cars, engines, hinges, wheels, machines, etc.) Does it help reduce energy? Which uses more energy, a well lubricated car, or one that needs grease? Which would use more gasoline? Get better mileage?

f. How do marbles reduce friction? (they act as bearings) Do they help conserve energy? How? (by reducing the energy needed to do work, by decreasing friction)

g. Give examples of articles with ball bearings. (bike wheels, skates, skateboards, car wheels)

h. Do rollers reduce friction? (yes, they act like bearings) Did they help conserve your energy in the experiment? How?

i. When is friction a good thing to have? (when stopping a car, lighting a match, running, lifting items, holding things)

Related Activities

1. Study how simple machines save energy and reduce friction.

2. Experiment with wheels or toy cars using oil or no oil to reduce friction.

Resources

Science 5, The Silver Burdett Science Program, General Learning Company, 1968, pp. 194-195.

Before You Begin

Materials: hand cream (with plunger-top dispenser if possible), sandpaper, small wood blocks, thumbtacks, heavy grease (such as wheel bearing grease from auto supply store), heavy motor oil like STP, screwdrivers with beveled tips, marbles, coffee can lids (the plastic ones with lips), four 3 foot lengths of steel pipe of equal diameter or similarly shaped objects such as dowels of wood (old broom handles will also work), a sturdy box capable of holding 100 pounds of weight, 100 pounds of weight (such as rocks, sand, bar bell weights)

Words To Know

friction, ball bearing, roller, reduce

Insulation Works

Curriculum Topic

ENERGY

Environmental Topic

ENERGY - RESOURCES

Skills

Constructing and testing hypotheses
Graphing data
Measuring
Using information for a purpose

Subject

Science

Grade Level(s)

3 - 5

Site

Classroom

Author

Cyndi Walsh

Objective

The student will be able to demonstrate an understanding of the properties of insulation.

To The Teacher

"Insulation is being produced from a variety of materials: vermiculite, fiberglass, rock wool and, significantly, old newsprint - referred to as cellulose insulation. The manufacturing process for cellulose insulation, although it requires heavy equipment, is relatively simple. The newsprint is finely shredded and then mixed with fire-retardant and vermin-resistant chemicals - boric acid, borax and aluminum sulfate. The finished product looks like thick gray lint, and is installed by a blower. Cellulose insulation frequently is cheaper than insulation made from other materials, and dollar for dollar and inch for inch, it has a higher "R factor" (a term used to measure resistance to heat flow) than other types of insulation." ("Current Science")

The following activities demonstrate the properties of insulation.

In the first experiment, students will discover that an insulated box will hold heat in a refrigerated environment. This can be compared to the insulation properties of a house or a goose down jacket on a cold winter's day. A graphing exercise concludes this activity and will provide a working knowledge of the metric system as milliliter and celsius units are used.

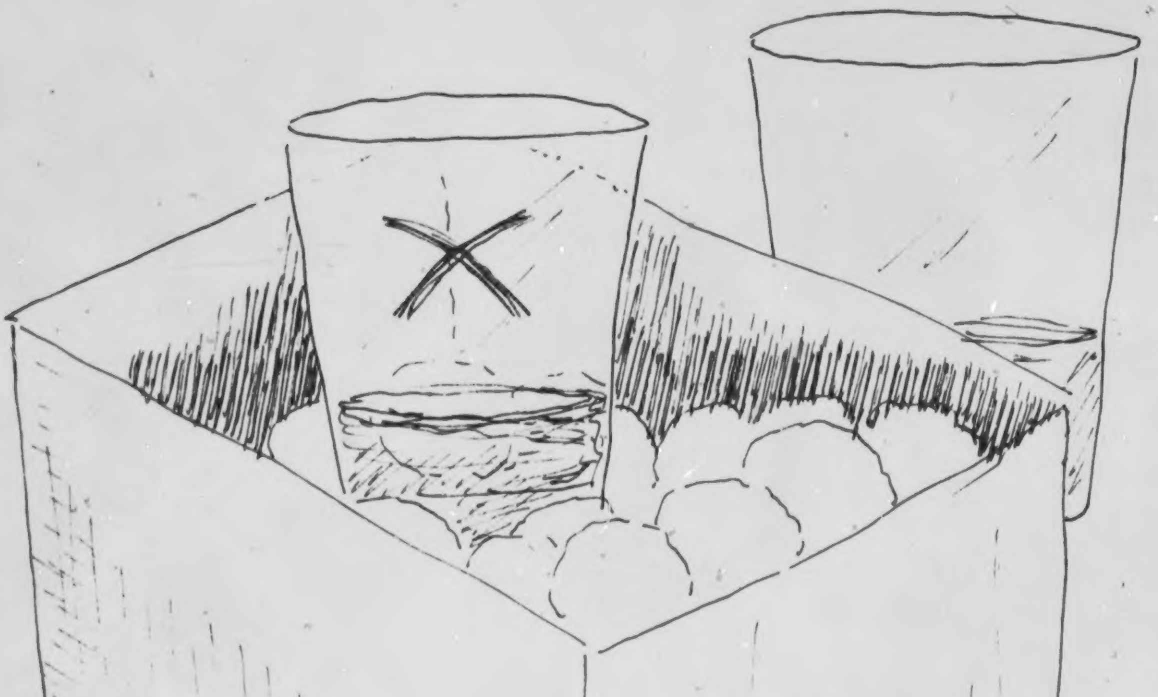
The second and third experiments will explore the insulation properties of the home refrigerator. (Before students conduct this experiment, obtain parental permission.) Students will discover that a cool temperature can be maintained in an unplugged refrigerator. They will also learn that when the door is opened every 5 minutes, the refrigerator does not maintain cooled temperatures. The results should encourage proper energy conservation in the home.

Before You Begin

MATERIALS: 2 celsius thermometers, cardboard shoe box with lid, cotton balls or other insulation material, 2 identical glass containers, graduated metric beaker or cup.

Words To Know

insulation, milliliter, celsius, thermometer



ACTIVITY

Depending on class size and availability of equipment, assign the following three experiments:

EXPERIMENT 1:

1. Make an "insulation box" by layering cotton balls inside the bottom of a small cardboard box.
2. Obtain two identical glass containers. Mark one of the containers with an X for identification.
3. Fill both containers with 25 ml of water at room temperature (18 degrees Celsius).
4. Record the temperature of each. Leave the thermometer in the containers.
5. Place the X container of water in the insulation box. Fill the surrounding space with cotton balls. Replace the lid.
6. Place both glass containers in the refrigerator.
7. Make an educated guess (hypothesis) about the temperature of each container in a half hour.
8. Record the temperatures every 5 minutes for half an hour.
9. Show the resulting temperatures on a graph or chart. What is your conclusion? Did your results support your hypothesis?
10. Discuss with the class how you would change or improve this experiment?

EXPERIMENT 2:

1. Record the room temperature reading in Celsius and Farenheit.
2. Then put the thermometer in the refrigerator for 15 minutes and record the temperature.
3. Put the thermometer in the refrigerator and unplug it. Leave the door closed for another 15 minutes with the thermometer still inside. Make a hypothesis about the result of this experiment.
4. After 15 minutes, record the temperature. What are your conclusions? What happened? Why? Do your conclusions support your hypothesis?

EXPERIMENT 3:

1. Fifteen minutes after the refrigerator is plugged in, do all of the above steps in experiment 2 with one variation. Open and close the refrigerator every 5 minutes, holding the door open for 30 seconds at a time.
2. Check the temperature every fifteen minutes. Do you think the temperature will remain the same? Make an hypothesis. Do your findings support your hypothesis?

Related Activities

1. Make insulated milk carton houses from different materials. Put ice cubes in the carton and then time the life of the ice cubes on a hot day.

2. Research refrigerators. Use consumer reports to find the most energy-conserving features.

Credit

"Current Science," Xerox Corporation, Middletown, Ohio, Vol. 63, No. 2, September 21, 1977
Drawing: Cecelia Zych

Resources

Energy-Environment Mini Unit Guide, NSTA, Washington, D.C., 1975, EEC #744

Notes To Myself

Build a Kite

Curriculum Topic

ENERGY FORMS

Environmental Topic

ENERGY - RESOURCES

Skills

Collecting, compiling, graphing and measuring data

Constructing a model

Subject

Science

Grade Level(s)

4 - 5

Site

classroom, large open areas: ball fields, beaches or playgrounds

Author

Paul Sanderson

Objective

The student will be able to:

1. construct a working kite and experiment with the amount of wind energy it can utilize,

2. plot a graph showing pounds of pull in relationship to wind speed or kite size.

To The Teacher

Our survival will depend upon our rational ability to make maximim use of our limited energy resources, and to exploit alternative sources with minimum impact to our environment.

Building kites and experimenting with them is a good way for students to gain first hand experience with an alternate form of energy, wind energy. Kites are inexpensive and easy to build. The tradition is that kites were invented by Archytas of Tarentum four centuries prior to the Christian era, but they have been in use among barbarous tribes like the Maoris of New Zealand and Asiatic peoples from time immemorial. Their purposes have included ceremonial, mystical, recreational, scientific, and military. Today, they serve chiefly as a fascinating toy, one that can introduce students to an energy source for the future, wind power.

"Wind is a solar energy form which results from the uneven heating of the earth's atmosphere by the sun. Wind is even more variable than sunlight, changing with location, season, and the weather of the moment. Wind seldom blows at a constant speed but rather swells and ebbs in an irregular fashion. Its flow is also affected by landscape.

"Wind can also provide both mechanical and electrical power and has a long history in the U.S., having been used extensively for water pumping and other mechanical chores by the settlers as they developed the western states. But by the middle of the twentieth century most wind machine companies had gone out of business and fossil fuels had taken over their former chores. Now, increasing costs and shortages of fossil fuels have given the windpower industry new life. Small, private companies are flourishing again and the federal government has begun to invest millions yearly in windpower research. The government program is focused primarily on large windmills which could supplement electric utility generating capacity.

"Windpower creates very little pollution, although the machines are unsightly. Net energy yields are also uncertain. However, both small- and large-scale wind systems have great potential." (Stephanson)

Before You Begin

1. Review the enclosed information on kites. It gives you everything you need to know about building the simple kite to be used in this experiment.

2. Materials needed for building kites include: wood for frame (bamboo or dowels are good or your lumber yard will cut pine, spruce, or cedar to your specifications), plus paper, cloth or plastic for the wings. Also, glue or cloth cement, thread, cord, string and paints or marker pens Masking tape, scissors, sharp knives, rulers, pens, pencils, clothespins, eyelets and grommets are helpful.

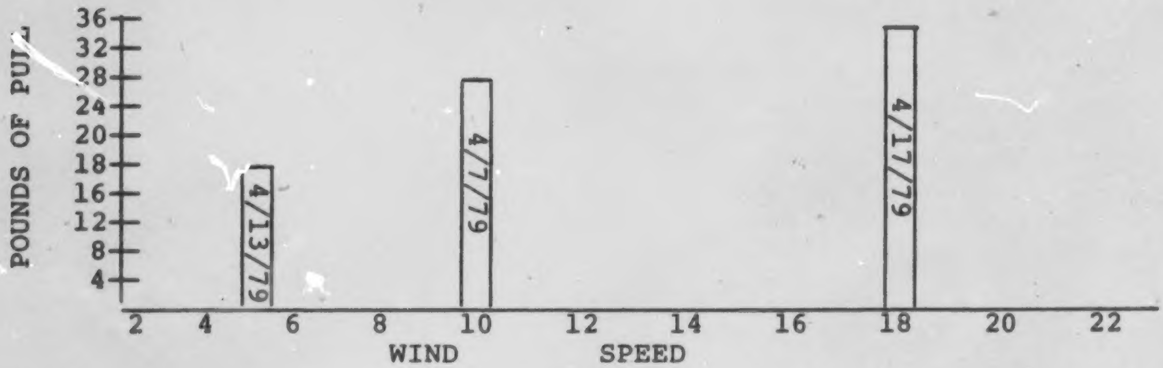
3. Obtain one or more hanging scales, such as the ones used to weigh fish. They should be small enough to be handled easily by your students. The higher the scale range (in pounds), the better. This scale will be attached to the kite's flying string to measure its pull in pounds.

4. Obtain a Beaufort scale in order to estimate wind speed. (One is included below.) An anemometer would be interesting to use, if one is available to you.

"In 1805 Rear Admiral Sir Francis Beaufort devised his classic wind scale for sailors, rating 0 as a dead calm and 12, the top number, as a hurricane. The numbers from 1 to 6, which are germane to kite-flying, can be translated like this:

1 - 1 to 3 mph. Smoke drifts lazily.
2 - 4 to 7 mph. Tree leaves rustle.
3 - 6 to 12 mph. Small flags fly, leaves dance.
4 - 13 to 18 mph. Trees toss, dust flies, paper skitters.
5 - 19 to 24 mph. Trees sway, kite strings break.
6 - 25 to 31 mph. Flying is risky." (Brummitt)

5. Devise a sample graph to demonstrate how the students will graph their data. For example:



6. This activity might work better in the spring. Wind is readily available then.

7. Be careful flying kites near power lines, buildings, roads, or before a storm.

Words To Know

Beaufort scale, "pull", graph, wind power alternative energy source

ACTIVITY

1. Build the two-sticker kite per instructions enclosed. Make sure you allow enough space for construction, especially if each student will be building a kite. Teams may work better in larger class situations. If you wish to learn more about kites, or investigate other designs, read Kites, by Wyatt Brummitt, Golden Press, 1971. It is an inexpensive paperback that everyone can use.

2. Fly the kites. As you do, have the students record estimates of wind speed, and the pull in pounds on the flying line using your scale.

3. Fly the kites several times, under varying wind speeds. Keep records of your experiments.

4. Using the data, plot a graph that shows the relationship between wind speed and "pull".

5. Then discuss:

   a) the relationship of wind speed to pull

   b) how your kite caught wind energy and converted it into "pull" energy

   c) what uses this "pull" energy might have (to pull carts, boats, lift objects, etc.)

   d) other ways to use wind energy (to run machines or wind mills, to generate electricity, to propel sailboats, parachutes).

   e) the environmental impact of wind power

Related Activities

1. Study how wind power is/was used in America as a source of energy.

2. Discuss some of the limitations of the wind as an alternative source of energy.

3. Visit a windmill, if possible.

Resources

Brummitt, Wyatt, Kites, Golden Press, N.Y., 1971

Credit

Stephanson, Lee, Energy Manual for Parks, National Recreation and Park Assoc., Arlington, VA, 1976

Drawing: Ann-Marie Fleming

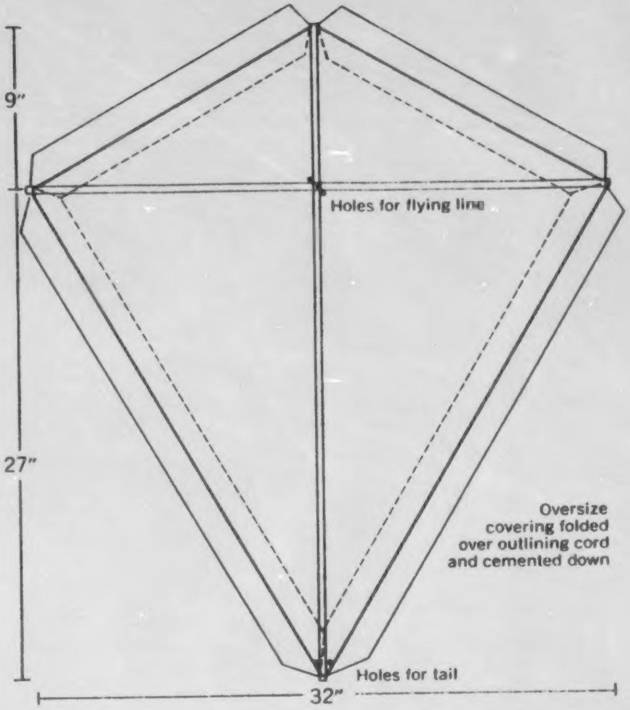
THE CLASSIC TWO-STICKER

The two-sticker is the most conventional, the most "kite shaped" kite. Like all flat kites, it requires a tail, and also like most such kites, it flies at a fairly low angle, with maximum drag and minimum lift.

As the drawing shows, you need two sticks: a mast and a somewhat shorter spar. The spar should cross the mast about a quarter of the way down. Center it there and fasten it at a right angle, using either a twisted rubber band or a few windings of thread-and-glue. Outline the kite with string tied to the four stick ends. Do not pull the string so tight that it warps the frame.

Spread out the covering—newspaper, shelving paper, butcher's paper, or any similar paper will do—and position the outlined frame on it. A couple of bits of tape will hold paper and frame together while you draw the outline of the kite on the paper. Make the outline an inch or two oversize so that, when the covering is cut to shape, there will be a margin to fold over and paste down over the outlining string. Notches must be cut in the covering where it fits around stick ends.

The flying line goes through holes in the face of the kite at the central mast-spar joint. To make the kite shipshape as well as to prevent rips, surround the holes with linen reinforcing rings—the sort used for bracing looseleaf notebook paper. The end of the flying line passes through the hole on one side of the joint and comes back out through the diagonally opposite hole. Tie it securely. Two holes on either side of the mast, just inside the bottom hems, give you a tying hold for the tail.

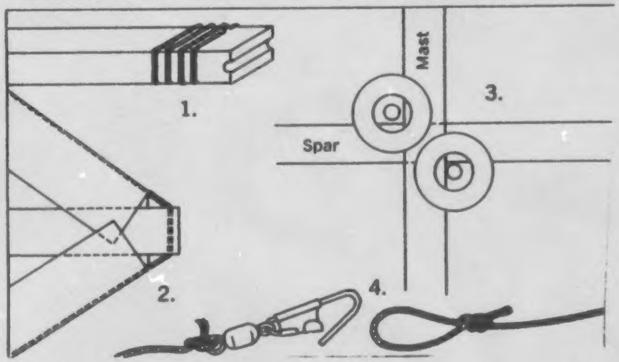

9"
27"
Holes for flying line
Oversize covering folded over outlining cord and cemented down
Holes for tail
32"

The tail need not be heavy. Its purpose is to resist the kite's naturally skittish tendencies. For a starter, try ten or twelve feet of kite line with crepe paper bows tied into it every foot or so. Flight tests will indicate whether the tail is too short or too long.

Kite tails are not intended to provide balance in terms of weight, which only makes a kite sluggish. Tails add drag, or resistance, allowing the kite to soar freely.

Unless you have a wind of 8 or 10 mph, you will probably need the help of a friend to get this kite airborne. The tail should be stretched out on the ground downwind of the kite so that, from the start, it is effective as a balance. If you have to run with this kite, as will almost certainly be necessary in very light winds, go to it.

Vary the dimensions shown as much as you please; nothing about this kite is very critical. Resist temptation to make it really big. The results are unrewarding. Flat kites may be primitive, but they are never dull. And they can be of almost any shape, size, or material.



THE TWO-STICKER In making your kite, you should (1) notch the spars to hold the outlining cord and bind the notched ends to prevent their splitting. The covering (2) should be cut away at the corners, allowing at least an inch of fold-over for cementing. The line or bridle (3) is connected at the central mast-spar joint, with gummed reinforcement circlets used to protect the covering around the holes. The flying line (4) can be connected directly or by means of a one-legged bridle. The connection is made easy with a loop and a fishing swivel. A swivel belongs on the end of every flying line.

Saving Heat

Curriculum Topic

ENERGY FORMS-HEAT

Environmental Topic

ENERGY-RESOURCES
ECONOMICS-TECHNOLOGY CULTURE

Skills

Observing, Experimenting,
Brainstorming

Subject

Science

Grade Level(s)

5

Site

Classroom or science laboratory

Author

Arthur C. Braun, Jr.
Antoinette R. Giovannitti

Objective

The child will be able to explain orally or demonstrated by experiment the vast quantities of sun energy which was trapped in the fossil fuels.

To The Teacher

The earth has always depended upon the sun for energy. It provides the heat for human, animal and plant life. Wood was the first source of controllable sun energy, and even today one-third of the world's population depends on firewood as its principal source of fuel. Millions of years ago, remains of plants and animals were trapped under the earth's surface and chemically changed into high energy resources, coal, petroleum and natural gas (fossil fuels).

The predominant source of energy for modern man has been these fossil fuels and is used for such simiple applications as heating water for industrial processes, drying materials, and producing low-temperature steam. Agriculture uses about 2% of the total U.S. energy, a large part of which is liquified petroleum gas used to dry and cure crops and to heat homes, animal shelters, and greenhouses. The lesson will help students to understand that the sun's energy was intensified when captured in these various fossil fuels.

Before You Begin

Materials:

7 beakers to hold water (pyrex) tongs or potholders

7 thermometers (celcius)

1 hot plate

hibachi and charcoal

kerosene or alcohol lamp

1 large table or shelf space

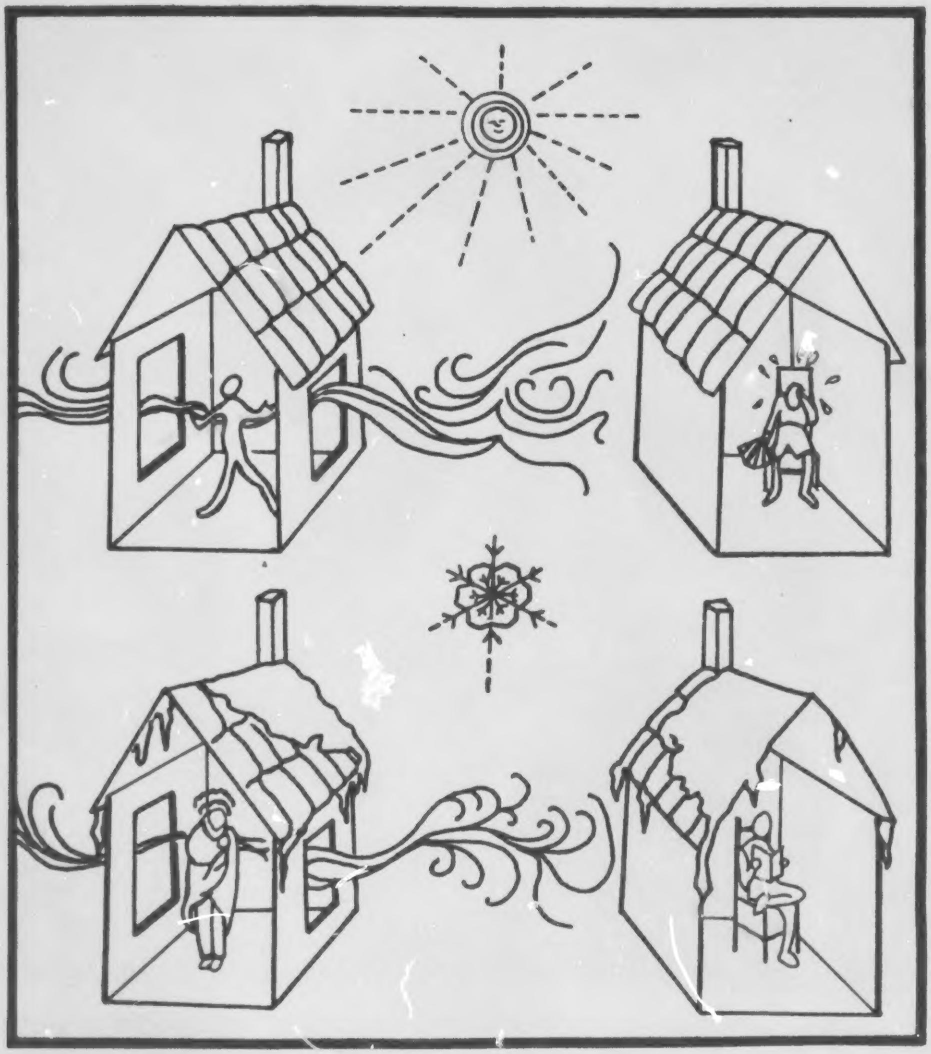
window with access to sunlight
butane gas
bunsen burner
asbestos sheets
chart for recording temperatures
3 ring stands

Caution:

Be sure beakers are made of pyrex-type glass. Do not use a clinical thermometer. Be sure students do not touch beaker with hands. Be sure to terminate the experiment once the thermometers have reached the boiling point (100°c) in order to avoid cracked beakers.

Words To Know

heat, thermometer, temperature, propane gas, bunsen burner, asbestos, fossil fuel, energy, kerosene.



The Climatic Effects of Wind and Sun.

ACTIVITY

1. Set up materials for demonstration in the classroom, including the following: 7 beakers filled with water with a thermometer in each one distributed according to the following directions:

A). Place in a spot in the classroom which has access to direct sunlight

B). Place in a spot which has no sunlight, such as a closet

C). Set up an electric hot plate

D). Set up a hibachi, with charcoal

E). Set up a Kerosene lamp

F). Set up a propane or butane stove

G). Set up bunsen burner

2. Choose a committee from the class whose responsibility will be to keep track of temperatures in each beaker, and record on a chart every 5 minutes until the water reaches 100°c or for ½ hour whichever comes first.

3. At conclusion of activity discuss:

A). What was the highest temperature that each beaker reached? (maximum 100°c).

B). Did the water absorb the same amt. of heat in all the trials ? (no) Explain your answer. (Students might think that the water should absorb the same amount of heat. But heat sources vary in intensity. Discuss this concept with students comparing the quality of energy available to each water beaker.

C). Which fuel was the most efficient heat source? (the one that resulted in the greatest temperature change in the least period of time).

D). Lead the class in a discussion, then, regarding the source of each energy form and the concept of a fossil fuel. Trace all energy to the sun.

Brainstorm a list of advantages of the fossil fuels and then compare these to a list of disadvantages. (Try to use information and inference only from the class experiment).

Related Activities

Consider how technology has worked to intensify the heat available directly from the sun. (Black paints, reflectors, insulators...)

Resources

Burkman, Ernest, Et al. The Natural World, Silver Burdett: 1975.

Credit

"Water Heating Demonstration" Environmental Education Activities Manual; edited and published by William A. Stapp and Dorothy A. Cox, 1974, pp.24-28

Solar Collectors

Curriculum Topic

ENERGY FORMS

Environmental Topic

ENERGY - RESOURCES
The sun is the primary source of energy.

Skills

Experimenting, observing, building models

Subject

Science

Grade Level(s)

4 - 5

Site

Classroom, schoolgrounds

Author

Paul Sanderson

Objective

The student will be able to:

1. manipulate apparatus by constructing a solar collector which can be tested to determine its ability to generate heat
2. illustrate the principle of solar energy collection.

To The Teacher

Sunlight is one of many forms of energy used by people today. It is possible to use this infinite form of energy to replace finite energy resources now in use. Currently, sunlight can heat water for our homes and offices, and can be converted to heat air to provide warmth throughout most of the year. This conversion is accomplished through the use of solar collectors, which absorb the heat of the sun and transfer it to a useable medium such as water or air. In this experiment, the students will themselves be able to collect sunlight and use it to generate heat.

Before You Begin

MATERIALS: oaktag or cardboard, heavy duty aluminum foil, coffee cans, masking tape, thermometers (registering over 200 degrees F), notebooks or paper, pencils

PREPARATION:

1. Build a model solar collector. Cover a full-sized sheet of oaktag with heavy-duty aluminum foil, shiny-side out. (See diagram 1). Tape the foil down securely. With foil on the inside, roll the short side of the oaktag into a cone shape, with a large opening at the top and a small opening (2"-3" in diameter) at the bottom. (See diagram 2). Tape the oaktag securely to keep the cone in this shape. You should end up with a large, foil-lined, open-ended cone (See diagram 3). Students may have some difficulty in making this shape. Fortunately, many variations will work well enough to illustrate the concept.

CAUTIONS:

1. Never look directly at the sun, even through dark glasses, lenses or mirrors.

2. Some collectors will reach termperatures of 200 degrees F and more. Be careful of this heat.

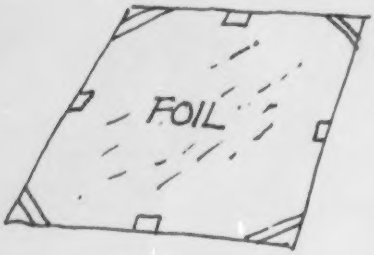


Diagram 1

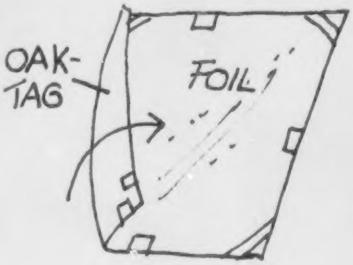


Diagram 2

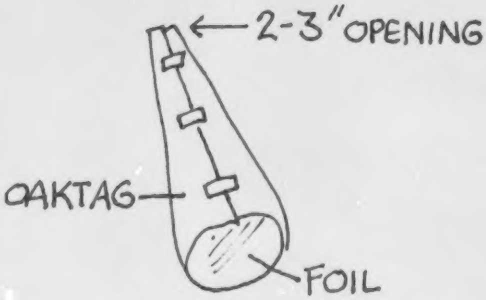


Diagram 3

Words To Know

solar collector, cardinal point

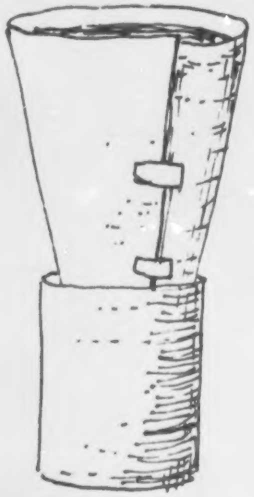


Diagram 4

ACTIVITY

1. Display the model solar collector.
2. Distribute materials to each student: oaktag, foil, tape and scissors.
3. Demonstrate how to make a collector.
4. Allow students to work at their own paces until each has completed a collector.
5. Place the small end of each collector into a coffee can. (See diagram 4).
6. Go outside to test the collectors in the sunlight. Orient the students to the direction, north, south, east west.
7. Place your thermometers in the coffee can and at other positions within the cone, to determine the heat generated. Have the children record in their notebooks the temperature in the collector, the temperature of the air, time of day, and the weather conditions. Encourage more experimentation: different times of day, under different weather conditions, etc.
8. Discuss:

   a) How did you make your solar collectors work most efficiently?

   b) What did the aluminum foil do to help collect the sun's heat energy?

   c) What weather conditions gave the best results? Why?

   d) In which cardinal direction (N,S,E,W) did you usually point your solar collector?

   e) What things found in nature collect and store the sun's energy? (rocks, sand, water, plants) What things created by man collect the sun's energy? (blacktop, cars, greenhouses)

   f) What uses can you find for the sun's energy?

Related Activities

1. Test the collectors on a cloudy day.
2. Cook food (such as marshmallows, toast, popcorn) in the collectors.
3. Experiment with other shapes and designs for solar collectors: boxes, parabolas, dishes, pyramids, etc. Compare the ability of each to generate heat.
4. Visit a solar-heated house, business office, swimming pool, etc.
5. Experiment with silocone solar cells and their uses.

Resources

Daniels, Farrington, Direct Use of the Sun, Yale University Press, 1964, EEC #D1

Sun, ed. Stephen Lyons, Friends of the Earth, 1978

Anderson, Bruce, The Solar Home Book, Cheshire Books, 1976, EEC #C107

Desalt of the Earth

Curriculum Topic

MATTER - physical properties of solutions
CHEMISTRY

Environmental Topic

ENERGY-RESOURCES

Skills

Constructing models, constructing and testing hypothesis

Subject

Science

Grade Level(s)

4-8

Site

Classroom or Laboratory

Author

Steve Gold

Objective

The student will be able to:

1. build a model desalinization plant powered by solar energy,
2. describe the process of distillation.

To The Teacher

Life on earth emerged in a watery medium, and is still entirely dependent upon this precious liquid. Though the earth's water resources are constantly flowing through the hydrological cycle, most of the planet's water is at any time, in the vast storehouse of the oceans. Less than 2% of the world's water is fresh, and more than 99% of the fresh water is ice. As water is used in greater and greater quantities, today 6,048 liters of it are used per person per day in the United States, pressure on supplies will increase because of pollution and depletion. The sea, a vast reservoir, may be mankind's water source of last resort.

The problem with seawater for human use is its salinity, which averages about 3.5% by weight. Such water cannot be used for drinking, would ruin cropland if used for irrigation, and would prove far too corrosive for most industrial uses. Removing the salt--desalinization--is essential if ocean water is to be used for human civilization.

Although a variety of desalting methods are being considered, distillation remains the oldest and simplest. Water is evaporated, leaving the salt as residue. The now-fresh water can recondense and is collected. This process goes on in nature all the time as water is evaporated from the ocean surface and recondenses in rain clouds.

Desalinization, for the moment, can at best supplement our fresh water resources. It currently provides less than .001% of the world's needs. Desalting on a massive scale is still far in the future. Two major problems with desalinization are the huge amounts of energy required for even a single desalinization plant, and the problem of what to do with the great amounts of salt residue. And although the amount of water in the oceans is immense compared to human needs, mere volume does not render the oceans invulnerable. Due regard must be shown for the health of the marine ecosystem. Desalinization is not a substitute for the wise preservation of clean, natural fresh water supplies.

This activity demonstrates the distillation process. It can be used to reinforce the understanding of solutions as physical, rather than chemical, combinations, and to instill concern for wise use of the compound which constitutes most of our bodies.

Before You Begin

Materials: Two or four students should work on each set-up.

wooden board, such as a large bread board; a sheet of aluminum foil large enough to cover the board; more aluminum foil sufficient for a trough; a rectangular pan of appropriate size, painted in advance with black enamel paint; sea water or salted tap water; two wire hangers or other stiff wire; large, clear plastic bags; a small beaker or measuring cup; scissors; a pebble, small rock, or other support, Student Page.

The activity should be conducted on a sunny day. If there is insufficient time to allow the students to observe the results, they could build the stills at any time and use them on the first sunny day. It is important that there be both enough sun and enough time for sufficient water to recondense. Of course, other things can be going on in the classroom while the water is being distilled.

Words To Know

distillation, solar energy, salt, saline, desalinization, evaporate, condense, solution

ACTIVITY

1. Ask the class to name the ways in which they use water. The list will soon become enormous, yet it might not include such uses as the making of everday items (e.g. newspaper: water is needed to make paper from pulp.)

2. Ask if anyone ever uses ocean water for most of these purposes. Why not?

3. Explain that ocean water is a solution of salt in water. So is fresh water, but the ocean is much more salty. (That is, the percentage of salt is higher.) Have students re-define the word solution.

4. Explain that the class will build apparatus to collect fresh water from salty water.

5. Hand out the instruction sheets, answering any questions the class may have about them.

6. Have students construct the stills.

7. Have students set up their stills. About half should be in strong sunlight; the other half should be in shade. If natural shade is not available, you can, of course, create shaded areas. Allow the class to observe their stills for several minutes and record their observations. Then let the stills sit for a time as the distillation process continues.

8. When the allotted time has elapsed let each group record the amount of water collected in its beaker. Let students taste the difference between the fresh water collected and the saltwater in the pan. Average the results for the groups whose set-ups were in the sunlight and those whose stills were shaded.

9. Have students, during discussion or in writing, try to explain the difference between the two averages. The explanation should include a hypothesis about how the still works (based on observations) and about the source of energy for the machine. Leading questions might include:

   a. Where does the water in your beaker come from? (The plastic bags.)

   b. How did it get there? (By condensing from the air.)

   c. How did it get into the air? (By evaporating from the water in the pan.)

   d. Which groups collected more water - those whose setups were in the shade, or those who left their stills in the sun? (Sun)

   e. Why? (The sun's rays provide the energy needed to evaporate the water.)

10. Lead further discussions in as much detail as you wish about water, desalinization, and pollution.

Related Activities

1. Perform the activity again, using graduated cylinders to carefully measure the amount of salt water placed in the pans. At the end of the activity, measure the amount of water left in the pan. Does the amount of fresh water collected plus the amount of salt water left in the pan equal the amount of water originally placed in the pan? Allow students to construct hypotheses to explain the difference.

2. Let one of the pans stay in the sunlight until the water is completely evaporated. Let students sample the salt residue.

Resources

G. Tyler Miller, Jr. Living in the Environment; Wadsworth Publishing Company, 1975, Ch. 14, esp. pp. 259-260, EEC #B79 and

A. Turk et al, Environmental Science; Saunders, 1974, Ch. 10, esp. pp. 404-405, EEC #B78, for general information about the water cycle and desalinization.

Credit

Directions for building the still come from:

"Build a Water Desalting Model:, Dolphin Log; The Cousteau Society, May/June 1978, page 2.

Notes To Myself

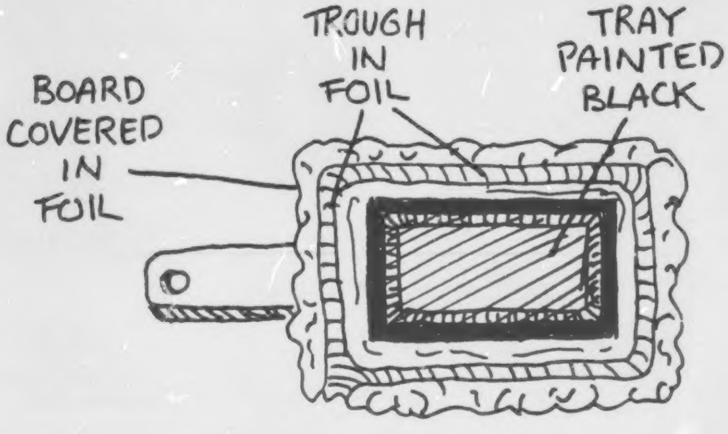
STUDENT PAGE

BUILDING A DESALINIZATION MODEL

1. BE SURE YOU HAVE ALL THE THINGS YOU WILL NEED:

   A WOODEN BOARD
   TWO SHEETS OF FOIL
   TWO WIRE HANGERS
   SCISSORS
   A PAN, PAINTED BLACK
   LARGE PLASTIC BAGS
   A MEASURING CUP
   A SMALL ROCK

2. COVER THE WOODEN BOARD WITH A SHEET OF FOIL.
3. SHAPE A TROUGH AROUND THE INSIDE EDGES OF THE BOARD WITH YOUR OTHER SHEET OF ALUMINUM FOIL. BE SURE THAT THERE IS AN OUTLET IN ONE CORNER.
4. PLACE YOUR PAN NEXT TO THE TROUGH ON THE BOARD. WHEN YOU ARE FINISHED, YOUR MODEL SHOULD LOOK SOMETHING LIKE THIS:

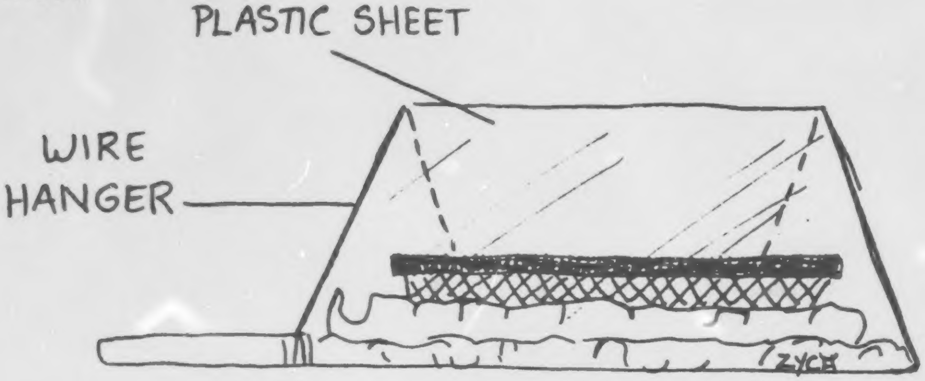


TOP VIEW

5. FILL THE PAN HALFWAY WITH THE SEAWATER OR SALTED TAP WATER YOUR TEACHER WILL GIVE YOU.
6. BEND TWO WIRE HANGERS OR OTHER STIFF WIRE TO MAKE A TRIANGULAR PRISM. MAKE SURE THAT THE SIDES OF THE PRISM FIT ON THE OUTSIDE OF THE BOARD.

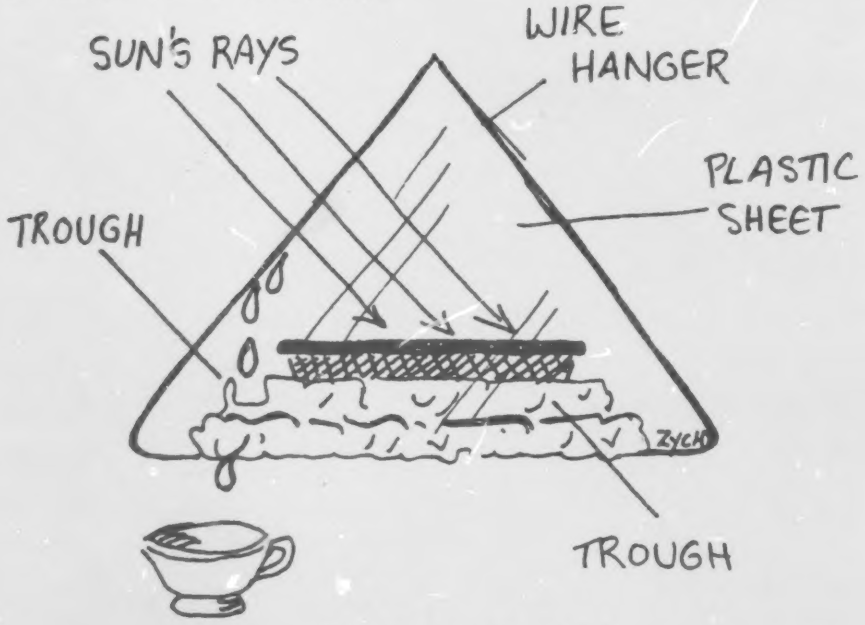
7. CUT YOUR PLASTIC BAGS INTO SINGLE SHEETS. MAKE A SEE-THROUGH TENT BY USING THESE SHEETS TO COVER THE OUTSIDE OF THE WIRE PRISM.

8. PLACE THE PLASTIC WIRE TENT AROUND THE OUTSIDE EDGE OF THE TROUGH, LIKE THIS:


PLASTIC SHEET
WIRE HANGER
ZYCH

SIDE VIEW

9. WHEN YOU ARE FINISHED, YOU WILL BE READY TO SET YOUR MODEL STILL TO WORK. PLACE IT IN STRONG SUNLIGHT OR IN THE SHADE, AS YOUR TEACHER DIRECTS. TILT IT WITH A SMALL ROCK SO THAT THE OUTLET OF THE TROUGH LEANS DOWNWARD. PLACE A CUP AT THE END OF THE OUTLET TO COLLECT YOUR FRESH WATER. HERE IS A VIEW OF WHAT YOUR MODEL MIGHT LOOK LIKE WHEN IT IS WORKING:


SUN'S RAYS
WIRE HANGER
PLASTIC SHEET
TROUGH
TROUGH
ZYCH

END VIEW

Draft-o-Meter

Curriculum Topic
METEOROLOGY

Environmental Topic
ENERGY - RESOURCES

Skills
Construction skills
Gathering information
Using information for a purpose

Subject
Science

Grade Level(s)
3

Site
Classroom
Schoolgrounds
Home

Author
Carla McGeeney

Objective

The students will be able to:

1. Determine when an air draft is present in a room.
2. Describe steps in the construction of a draft-o-meter.
3. Recognize the relation between a draft and energy loss.

To The Teacher

An anthropological definition of the primary function of a home is its ability to provide a comfort zone for the inhabitants. In this way, it can be considered to be a shell with a roof, sides and foundation. The primary use of energy in the home is for heating and cooling, and considerable energy savings can be achieved by improving the "shell". A savings of 20% to 40% of energy consumption in an average home could easily be accomplished by improving insulation, caulking, weatherstripping and/or storm windows.

Using the draft-o-meter, the students should be able to determine and describe features of the construction of their school "shell" and of their home "shells." They will be able to detect drafts, and from this data, infer information to describe the architectural surroundings in which they live and study.

Before You Begin

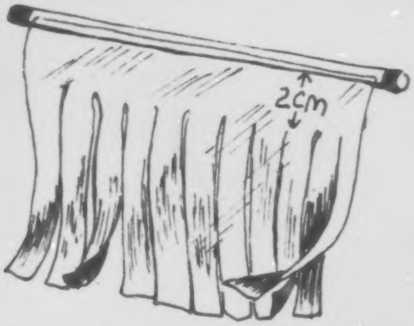
Forced air furnaces must be off to use a draft-o-meter.

MATERIALS: for each student: 1 kleenex, tape, stick or dowel (12 cm in length) or a pencil

ACTIVITY

1. Instruct students to tape the kleenex to the stick, lengthwise.

2. Cut the kleenex into strips (see picture) to within 2 cm of the dowel.



3. The draft-o-meter is now ready to use. Assign students to different areas of the school where they can test windows and doors. At each site, students should record the location and amount of draft: whether there is little waving of the strips or a lot of waving. (A demonstration of the differences would be helpful.)

4. At the conclusion of the search:

a) Have students write a letter to the school principal in which they will describe the results of their findings.

b) Lead a discussion about drafts and how they contribute to energy waste.

Related Activities

Let students take their draft-o-meters home to test their "shells" there and to discuss the results with their parents.

Credit

"Conservation: Science Activities in Energy," 1977 (can be purchased from U.S. Department of Energy, Technical Information Center, P.O. Box 62, Oak Ridge, Tennessee 37830)

Words To Know

draft, insulation, caulking, weatherstripping

Notes To Myself

Clay Tankers

Curriculum Topic
SHAPES THAT FLOAT

Environmental Topic
ENERGY - RESOURCES

Skills
Classifying, observing

Subject
Science

Grade Level(s)
3

Site
Classroom

Author
Steve Gold

Objective

Students will be able to distinguish characteristic shapes of cargo vessels and demonstrate the importance of ballast.

To The Teacher

In February, 1978, the United States imported over 18 million barrels of crude oil and petroleum products daily, most arriving in tanker ships, which make more than 15,000 calls yearly in the U.S. alone. Increasing tanker traffic has contributed to an alarming number of oil spills in the oceans and rivers of the world - over 10,000 annually. A quarter of spilled oil comes from routine tanker operations rather than spectacular (Argo Merchant, Torrey Canyon) spills. Tankers have grown progressively larger, the largest tankers being 16,000 deadweight tons (volume) at the beginning of World War II, while tankers of three to five hundred thousand tons are common today. Increase in ship size was made feasible by the slower increase of operating costs: since crew size is about the same for all tankers over 35,000 tons, it is less expensive to use one 500,000 ton tanker than two half the size.

The designer of supertankers faces money constraints and the low maneuverability of the tanker itself which may need ten times its own length to stop. The shipbuilder's usual problems - buoyancy, stability and strength - are greater in building ships as long as 1200 feet. Since tankers are only floating tanks, they are, when empty, extremely buoyant. They ride high in the water, and can even flip end over end in rough seas. To lend stability, tankers commonly take on ballast, or stored seawater. Oil residue mixes with this ocean water in the tanks. Eventually, the discharge of ballast in shallow water or near port, to allow loading of the ship, becomes a major cause of oil pollution.

Long-term effects of oil in the ocean are still in debate. Some petroleum is known to contaminate shellfish and major crude spills foul beaches, kill birds, and may contribute to long-term ecological changes of unforeseen consequences.

Before You Begin

Materials: modeling clay (oil base), metal weight (or penny rolls, iron bars, etc.), basin of water, plastic sandwich bags, cardboard, toothpicks, thumb tacks, marbles (optional), "Tic-Tac" or match boxes

Preparations: Construct from clay hollowed-out, crude models of a container ship, a general cargo ship, and an oil tanker. The attached diagrams show the shapes of vessels. The tanker should be the largest. The clay walls should be as thin as feasible.

The tanker's important characteristics are: broad beam (width), aft (rear) superstructure, with all the remaining space for tanks. It is quite simple to build. Begin with the basic hull shape, which doubles for the tank area of the boat. Add the solid, rectangular superstructure at one end. Tack one or more sandwich bags (you may have to cut them to fit) to the inside walls. These are your tanks. Cardboard, cut to shape and tacked across the top, is your deck. You may have some trouble keeping your boat afloat at first, since it will tend to sink at the heavy end and capsize. To compensate, remove clay from the superstructure or add it to the raised forward part of the deck. The boat should be stable enough to float when empty, but a small weight added to the heavy end should be enough to flip it over. When the tanks are full, 3/4 of the tank area should be below waterline.

The most unique thing about a container ship is that all its cargo is carried on deck in uniformly-sized boxes. To build the container ship, start with the hull shape. Add fore and aft superstructures. The deck can be a layer of clay or heavy cardboard tacked across the hull. Insert toothpicks in rows across the deck to position your containers, which may be empty boxes from "Tic-Tac" candy, matchboxes, or similar containers.

The general cargo ship carries all types of packages in holds below deck. Its hull is narrow at the fore and broad at the aft end. This ship is quite easy to build. Begin with the hull. You might insert vertical pieces of cardboard to divide the ship into several holds. Then, tack on the cardboard deck. About two-thirds of the way to the ship's aft, add a small clay superstructure. Make sure it is light enough to avoid capsizing the boat. If this becomes a real problem, add clay to the walls of the hull in the fore part of the vessel, below deck. Fully laden with an appropriate cargo (pennies or marbles), about half the hull should be below the waterline.
Caution: Always test your models for floatability and cargo capacity in advance. Test the results of demonstrations of ballast ahead of time.

Words To Know

oil spill, tanker, ballast, supertanker, cargo, container ship

ACTIVITY

1. When students have completed a unit on clay boats, show them your three models. Display your cargoes (water or vegetable oil, boxes, and marbles) and ask which boat they think would be best to carry each cargo.

2. When the boats have been identified, focus attention on the tanker and point out its major features. Remove the deck and have a student try to put as much water in the tanks as possible without capsizing the boat. Students should observe that the boat rides lower in the water as the tanks are filled.

3. Explain to the students that tankers carry oil from countries like Saudi Arabia to countries like the U.S., traveling across many miles of often rough seas. Empty the tanker and ask what might happen if a large wave were rising on the front of the vessel and falling at the rear: "It might tip over." Demonstrate by placing a metal weight (or bar, or several penny rolls in a plastic bag) on the aft superstructure.

4. Have students suggest ways to keep the ship stable under such conditions. They may suggest ballast of their own accord. Demonstrate that the boat does not tip when weight is added.

5. Discuss ballast and the problem of oil pollution because of ballast discharge. You might ask:

a) Where would a real tanker, empty at sea, get its ballast?

b) Where could the ballast be stored? (oil tanks)

c) What would happen if there were some oil sticking on the walls of the tanks?

d) What would the ship do when it was time to take on oil?

e) What problems could that cause?

f) How could that be avoided? (Clean tanks before taking on ballast; build ships with separate ballast tanks.)

6. Additional discussion questions:

a) Which do you think would cost less, building and using one big tanker or two smaller ones?

b) Why do you think big tankers often have accidents?

c) What do you think happens to sea life if there is a big oil spill?

d) Why do you suppose tankers are not built with separate ballast tanks? ($$$)

Related Activities

An activity on oil pollution is a good follow-up. Spread vegetable oil in a thin layer atop the water. Find the best way to clean it up. Try spreading shredded paper to absorb it, using clay-sealed plastic straws as booms to contain it, skimming it with a spoon, or spreading detergent on it to try to emulsify it.

A variation of this activity would begin with a challenge to the students to build a boat to hold oil. The teacher would not build boats.

Resources

On tankers, cargo ships, and their shapes (with photos):

Braynard, F. O., "Ship: Fuel Powered Vessels," Encyclopedia Americana, 1976, Vol. 24, pp. 730-740

Lewis, E.V., Ships, Time-Life, 1970

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For statistics on oil and oil pollution:

Cowan, E., Oil and Water, Lippincott, 1968, esp. Ch. 3: "Tankers Get Larger and Larger, and That is Progress"

Hampton, J., "Superships, Superhazards," National Observer, Nov. 16, 1974, p. 28

Steinhardt, C. and J., Energy, Duxbury Press, 1974

Stewart, R.J., "Tankers in U.S. Waters," Oceanus, Fall, 1977, pp. 74-85

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"United States Petroleum Highlights," The Petroleum Situation, March, 1978

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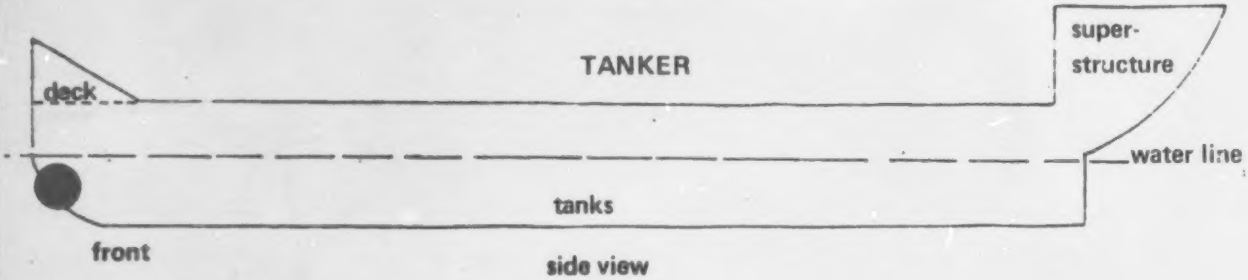
Callaghan, S.S., "Teacher's Activity Guide to Coastal Awareness," Coastal Resource Center, University of Rhode Island, Marine Bulletin No. 23, 1976, EEC #819

Teacher's Guide for Clay Boats, McGraw-Hill, 1969

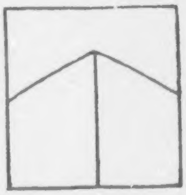
Credit

Illustrations, Ann-Marie M. Fleming

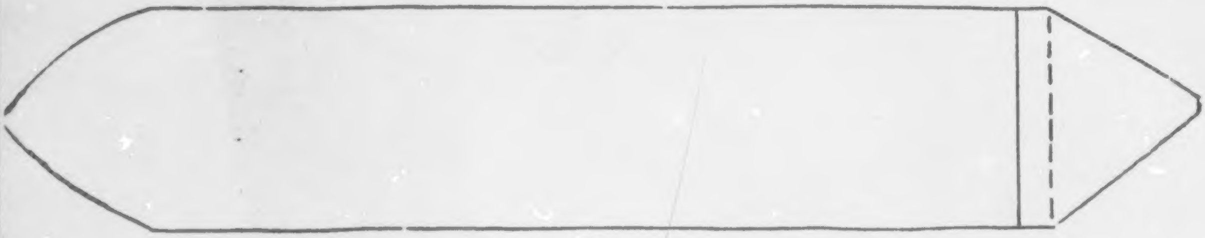
TANKER


deck
super-
structure
water line
tanks
front

side view

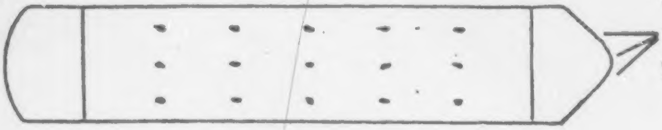


front

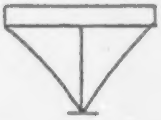


view from above

CONTAINER SHIP


toothpicks in rows of
three to position containers

view from above



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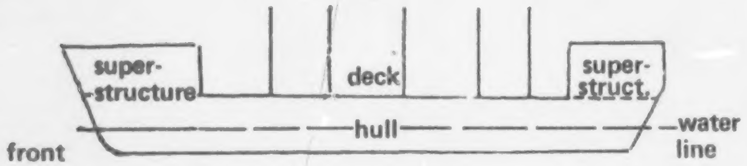
super-
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deck
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hull
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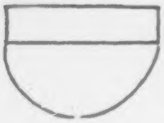
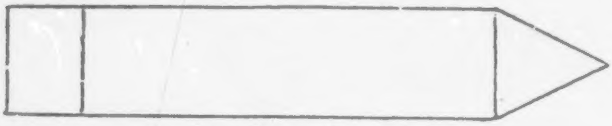
line
front

side view

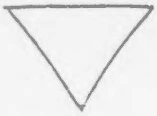
GENERAL CARGO SHIP



rear



view from above



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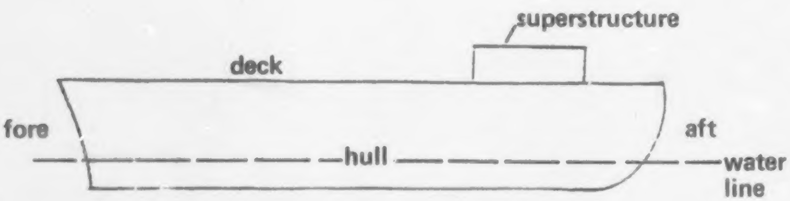
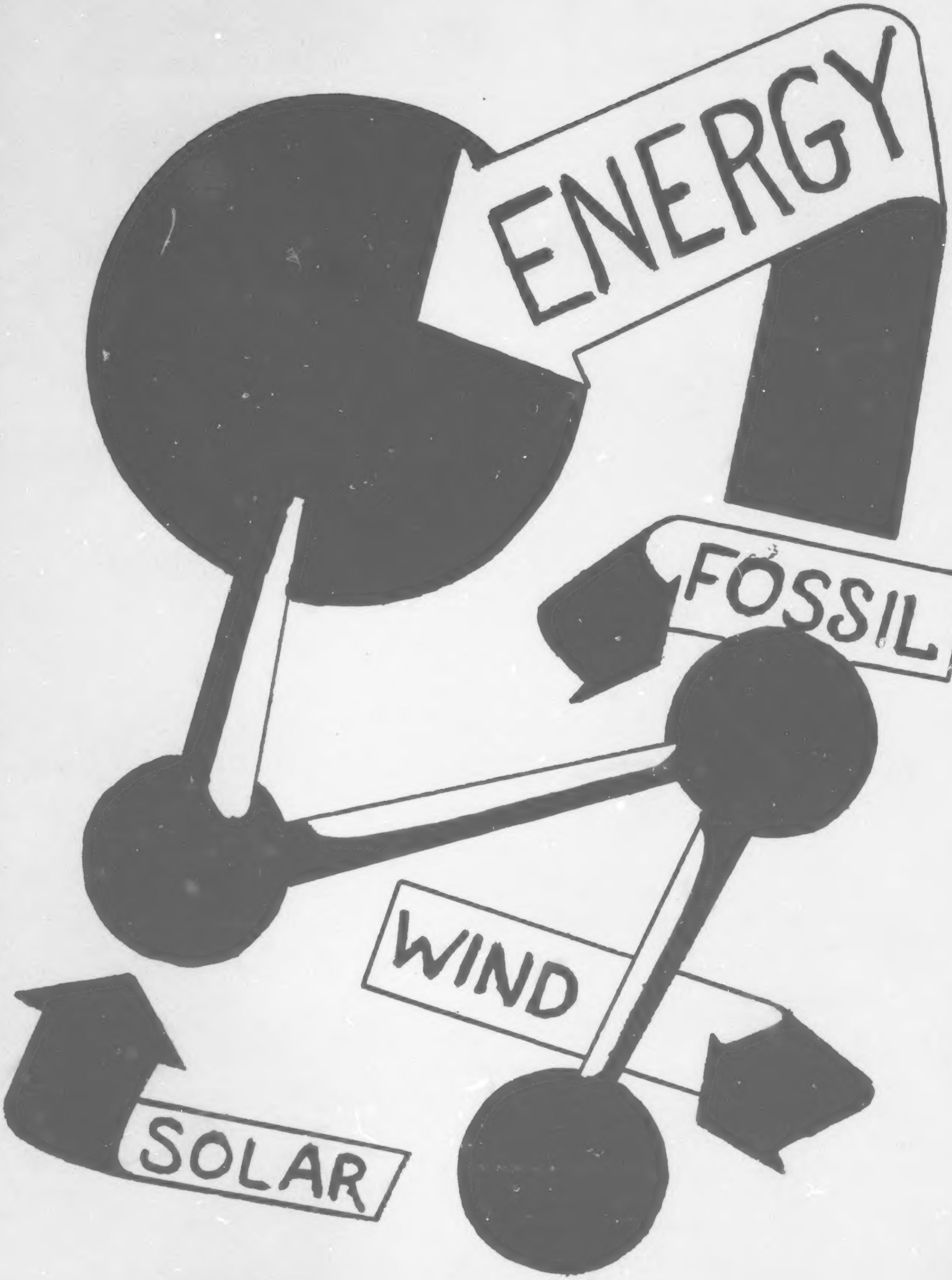
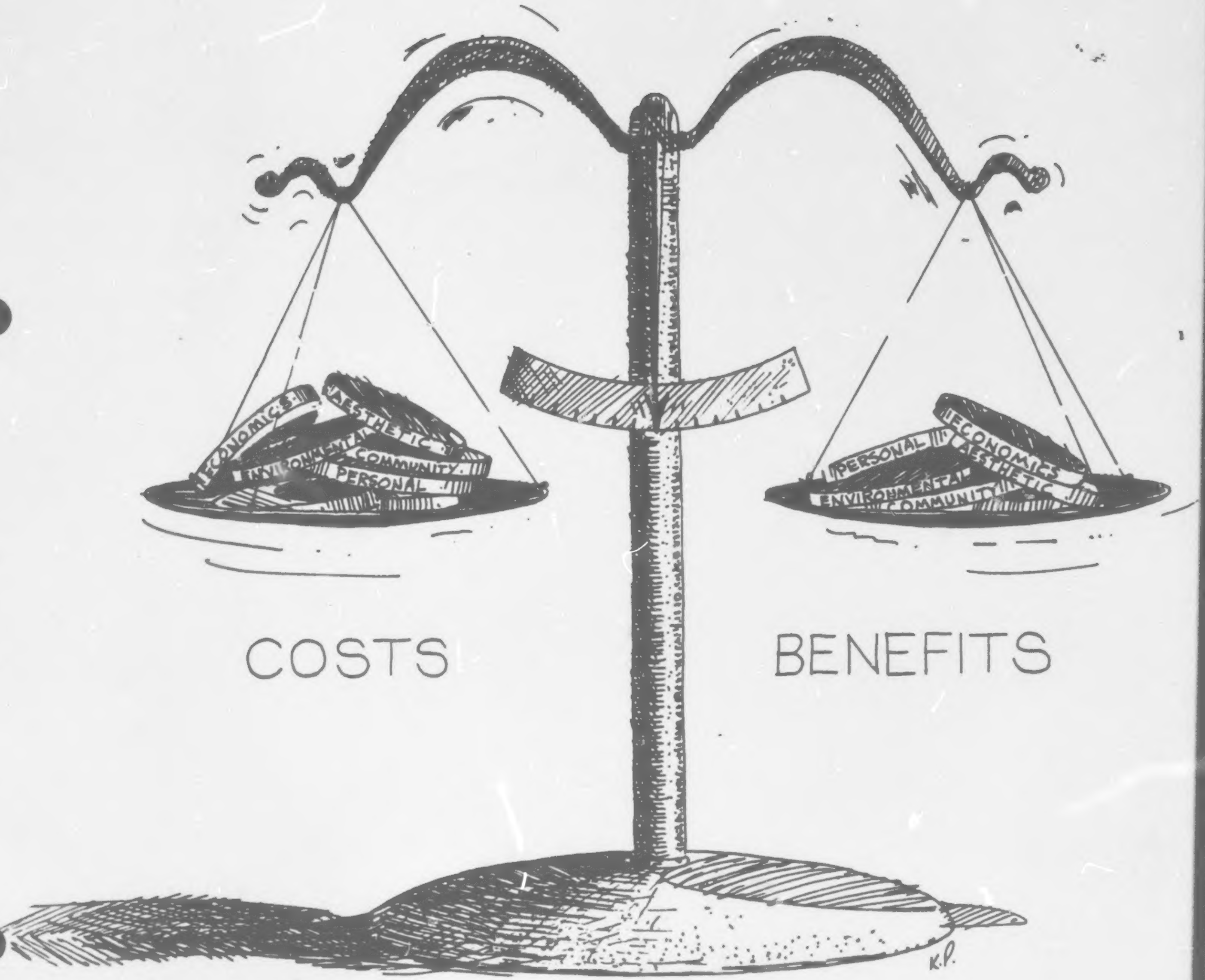

superstructure
deck
fore
aft
hull
water
line

side view


ENERGY
FOSSIL
WIND
SOLAR

ECONOMICS, TECHNOLOGY, and CULTURE


ECONOMICS
AESTHETIC
ENVIRONMENTAL
COMMUNITY
PERSONAL
PERSONAL
ECONOMICS
AESTHETIC
ENVIRONMENTAL
COMMUNITY
COSTS
BENEFITS
K.P.

ECONOMICS, TECHNOLOGY, AND CULTURE

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ECONOMICS, TECHNOLOGY, and CULTURE

The Environmental Education Act Amendment explicitly includes the necessity for consideration of the relationships between the impacts of environmental, economic and social concerns. In this context, we can examine the development of cultures in terms of their technological and economic changes, in relation to their environmental resource base.

The history of humanity can be looked at in terms of energy, technology, and economics -- both the discovery of principles and the invention and marketing of tools designed to improve living and working conditions. This is particularly the case in industrialized cultures like the U.S., where notable periods of history have been characterized by events that were considered to be bridges to further development, such as the development of the steam engine, or the integrated electronic circuit. We can discern four major periods of cultural history, made distinct by the discovery of important principles or the invention of important tools and technologies. These periods are:

--hunter-gatherer society, in which the discovery of fire was made;

--agrarian society, in which the technology of cultivation made possible the first permanent social groupings;

--pre-industrial or advanced agrarian society, which includes the Middle Ages and the Renaissance, and the introduction of capitalism as a permanent social form; and

--industrial society, exemplified by the Industrial Revolution, which offered abundant opportunities in agriculture, transportation, and national industry.

Many observers consider that we are now beginning the fifth period, a post-industrial society, where we look to alternative technologies and changes in economic growth patterns.

TECHNOLOGY

Sciences and technological advancements have made marked contributions in adapting the natural environments in which we live to social needs, by creating tools for shaping urban centers, agricultural systems, and information networks. The impacts of technological change have become important issues of public concern, as the often unforeseen and most unwanted effects become clearly evident. Some of these are direct, such as the obvious pollutions and general degradation of the environment.

Others are indirect social consequences, are more subtle, and therefore more difficult to measure. These are effects that arise from the societal adjustments required to accommodate and incorporate technological change. They include increasing dissatisfaction with education, business and government practices, and general changes in overall "quality of life." Many of these impacts are often directly attributed to "technology" itself, rather than to shifts in overall societal thought and goals.

An environmentally concerned public should be aware of two basic types of technological change. The first concerns the development of new technologies; the second involves the effects of new applications of existing technologies. In the context of environmental education, we can begin to understand the distinctions between those impacts directly caused by technology and those which have a deeper root in society. To do this, we can create a framework of information about the technology in question that is broken into two major areas:

1.) that which addresses the nature of the technology itself, its technical structure and function, and

2.) that which poses questions about the implications of the technology and its applications. This second category extends beyond the technical to the economic, political, social, and environmental consequences of technological impact

CONCLUSION

A systemic evaluation of economic and technological development -- past, present, and future -- must examine the relationships between technologies and political structure, law, economics, and social structures. This includes the "problems of success" caused by advances in technology and human ingenuity, which can be anticipated utilizing a holistic EE perspective. An environmentally literate citizen will understand these relationships and be able to apply this knowledge to the evaluation of economic, cultural and technological issues.

High School Energy/Environmental Education Training Model: Content Sourcebook prepared by Far West Laboratory for Education Research and Development, 1978 (Draft version)

The Price of Wheat

Curriculum Topic
NORTH AMERICA

Environmental Topic
ECONOMICS, TECHNOLOGY & CULTURE

Skills
Listening, computing

Subject
Social Studies

Grade Level(s)
5-6

Site
Classroom

Author
Paul Sanderson

Objective

The student will be able to:

1. participate in a game which simulates economics of wheat farming,
2. recognize that farmers do not control the prices they receive, but that the prices are determined by several variable factors.

To The Teacher

Wheat farmers are often at the mercy of the market place. They have some control over the number of crops they plant, fertilization and crop management, but they cannot be sure of the price return they will eventually receive at harvest time. Price is determined, in part, by supply and demand: amount harvested and need expressed by buyers. If demand is high, prices go up and the farmer profits. If demand is low, despite a full harvest, the farmer loses profits. Whatever, market conditions, the farmer must always pay his expenses. If he has a bad crop, he may lose money and go bankurpt, or at least into debt. A series of bad crops and/or bad prices can force the farmer out of business. This game-activity simulates some of the factors and problems farmers face in the wheat farming business.

Before You Begin

Preparation: Read the sheet "How to Play: Rules and Procedures". Become familiar with the game.

Reproduce enough deeds, money, and expense tokens to meet the needs of your class.

Materials: supply pencils and scratch paper
each player will need 1 die (can be taken from other games [Yatzee has lots of dice])

Words To Know

market, supply and demand, drought, bumper crop, fertilizer , expense, crop dusting, wheat, harvest, mortgage.

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ACTIVITY

1. Explain that everyone in the class is going to become a wheat farmer, by playing a game. Some people will make money. Some won't.

2. Explain the rules of the game. Write a list of key rules on the blackboard. Choose a banker or play the role yourself.

3. Pass out the money with which each farmer will buy wheat seed and pay other expenses. Tokens are given in exchange as receipts of payment.

4. Play the game for 5 "seasons" or other predetermined length of time.

5. When the game is completed, discuss:
   a. How many people made money? What helped you succeed?
   b. How many people lost money? What caused you to fail?
   c. What things can farmers depend upon? (Expenses, amount of crop planted, fertilizer.)
   d. What things are the farmers not able to control? (crops die, the price of crops and weather conditions are variable.)
   e. What determines a good or bad market? (supply and demand)
   f. What determines demand? (price of flour, food, amount of money available for spending, crop failures in other places, surplus wheat)
   g. Why would the government pay a farmer for not growing wheat? (to increase demand)

Related Activities

1. Play according to your own rules. Create new conditions and variables.

2. Investigate further the economics of wheat marketing. Consider the influence of American agriculture on world food sources.

Notes To Myself

STUDENT PAGE

HOW TO PLAY
Rules and Procedures

At the beginning of the game:

Each player receives, from the banker, $15 and a deed to a farm. The game covers one season.

1. At the beginning of each round, each player must pay for expenses.

sack of wheat seed at	$1 per sack
farmhand pay	$2
crop dusting	$2
energy (gas, oil, electricity, machine up keep)	$2
fertilizer	$2
living expenses (food, housing, clothing, taxes, schooling, transportation)	$2

2. Each player must "plant" 5 sacks of wheat in the first season. Thus expenses for the first round equal $15.00 for every player.

3. Each player receives a token for every expense paid.

4. Each player rolls a die to determine harvest price:

harvest price is = # of wheat seed bags x role of die:

1 is a drought
2 is a crop failure
3 is a poor crop market
4 is an average crop market
5 is a good crop market
6 is a "bumper crop"

First season harvest income is, therefore, from $5-$30 depending upon the roll of the die.

5. Banker pays each player the harvest price determined by the roll of his die.

6. If a player rolls "1", he is brankrupt. He must return the deed, receive $5, and join another farm with which he combines his assets.

7. If a player rolls "2" he can:

   a. miss a season's planting and receive a government subsidy of $15. He must, however, spend $10 for expenses for the season lost . Only one subsidy per farm per game; OR

   b. mortgage the farm to the bank for $15 and continue to play. This farmer must pay $8 to the bank on his next season

($5 principle, $3 interest inorder to pay off the loan.) Only one mortgage per farm per game.

8. A roll of "3" breaks even (profits cover expenses) and farmer may replant next season.

9. A roll of "4, 5 or 6" the farmer may replant for the next season and invest $5 in "Super Grow" fertilizer which doubles (2x) harvest prices on rolls of 4, 5 or 6 in the next harvest. "Super Grow" does not help a roll of 1 or 2. Only one "Super Grow" per season.

10. After each season's harvest has been determined by the roll of the die, all deals (mortgages, purchases, etc.) are made with the banker and expense tokens collected.

11. Start the next planting season.

SUPPLEMENTARY

1. A player is bankrupt when he cannot cover expenses and plant wheat (at least one bag of seed). $11 dollars is necessary, after profits, mortgages, subsidies have been counted. (Remember: When a player goes bankrupt, he receives $5 for the deed, and may join another farm.)

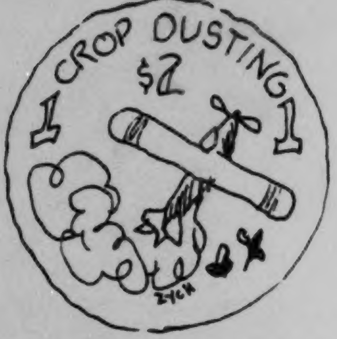
2. A farmer may buy less than 5 bags of seed after the first season, but he must buy at least 1 bag (per season) while he is in active play.

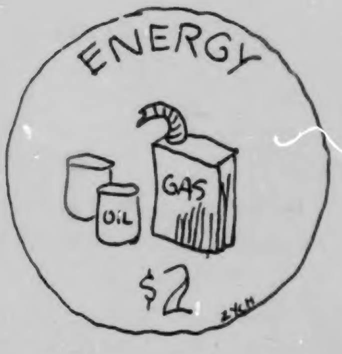
3. A rich farmer may buy a bankrupt farm from the bank for $25, and can then play more than one according to the rules of the game.

4. A player can mortgage, or go on subsidy whenever the situation necessitates, but only once each game per farm.

5. Play continues for 5 planting seasons, or 30 minutes.

6. The "winner" will be the farmer with the most money at the completion of the game.


CROP DUSTING
$2
1
1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GAS
OIL
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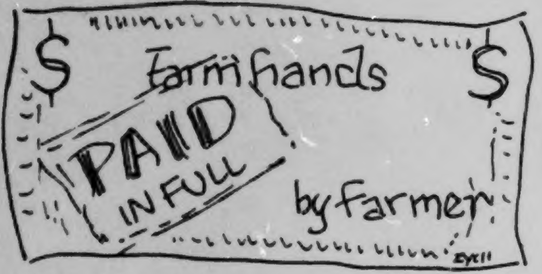
$
~~Farm~~ hands
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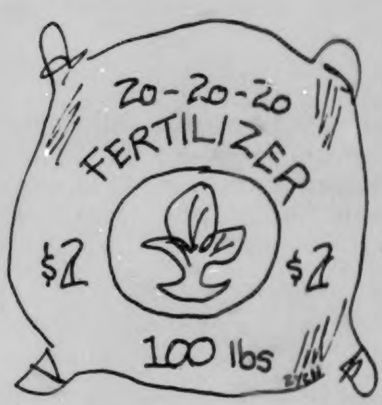
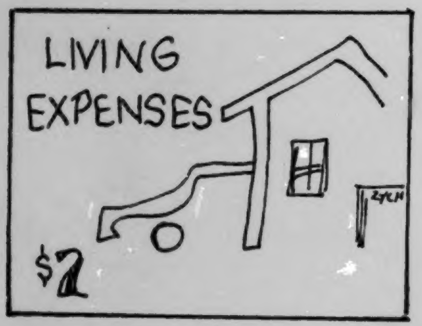
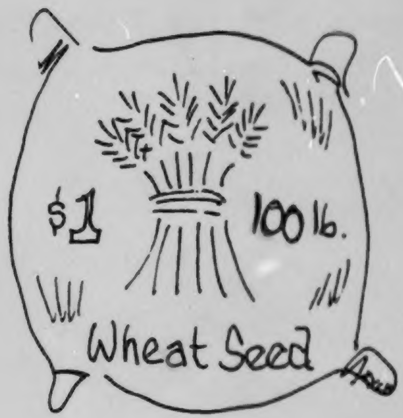
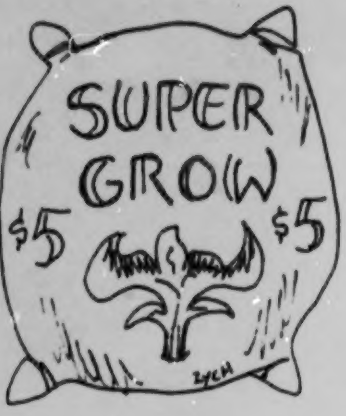
PAID
IN FULL
by Farmer


20-20-20
FERTILIZER
$2
$2
100 lbs


LIVING
EXPENSES
$2


$1
100 lb.
Wheat Seed


SUPER
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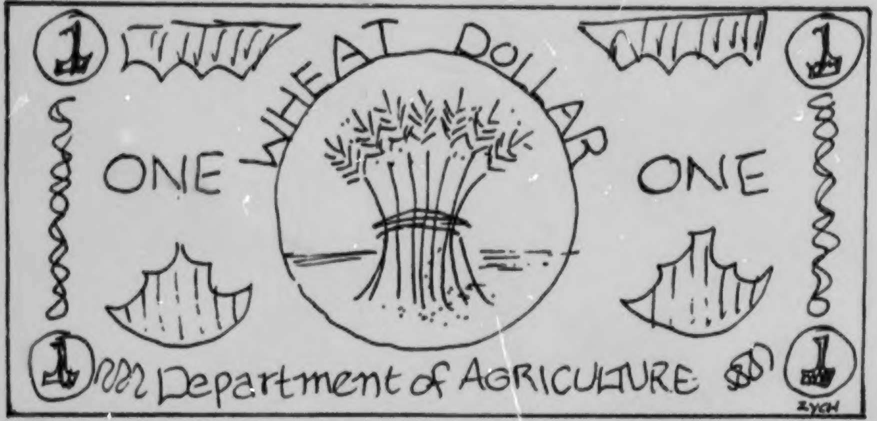
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WHEAT DOLLAR
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Department of AGRICULTURE
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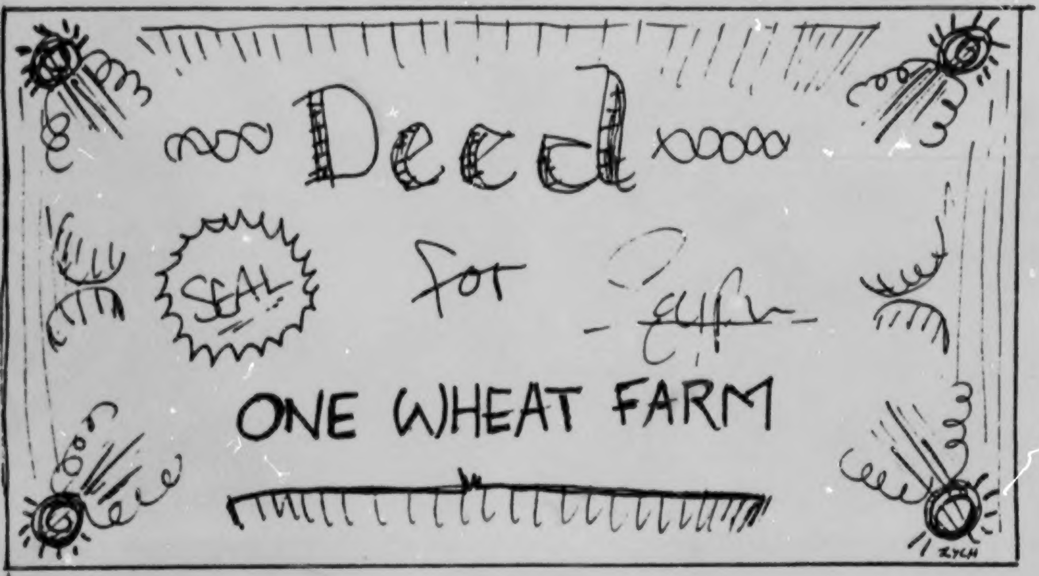
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ONE WHEAT FARM
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Build an Indian Wigwam

Curriculum Topic

INDIANS

Environmental Topic

ECONOMICS, TECHNOLOGY AND CULTURE

Skills

Using information for a purpose
Constructing models

Subject

Social Studies

Grade Level(s)

4-5

Site

Classroom, field or woods near school

Author

Paul Sanderson

Objective

The student will be able to:

1. participate in the construction of a wigwam.
2. recognize that Indians used materials found in the immediate natural environment to construct their housing.

To The Teacher

Indian culture required constant contact with the natural environment. They were able to find from the woods, fields, rivers and seashores around them, everything they needed to sustain life. The Indian tribes of Connecticut, among them the Pequots, Wepawaugs, Quinnipiacs and Hammonasetts, lived their lives hunting, fishing and farming in the land that we now call home.

Their houses, called wigwams, were illustrative reformations of materials provided by the immediate natural environment. Using only materials found close at hand, such as saplings, tree barks, vines, grasses, skins and sod, the Indians constructed comfortable shelters. The wigwam offered protection from climactic elements. A group of them built together formed the nucleus of the tribal unit. The information below describes the wigwam in more detail. It is excerpted from Chandler Whipples's The Indian and White Man in Connecticut.

"A wigwam or "wikwam" is the Algonquian word for house. It was shaped like a dome.

The man built the frame of the house out of tall, thin tree trunks called saplings. He firmly set about eight or ten saplings into the ground about two feet apart to form a half-circle. He set the same number on the other side. He then arched the matching pairs together and tied them with strong narrow strips of bark, root fibers, or hemp twine.

To make the framework stronger, the man lashed more saplings across the arched saplings.

The woman took over the rest of the work. She covered the framework with overlapping pieces of bark or strong mats. Light birch bark was used in the summer. Heavy elm or walnut bark was used in the winter. Mats made of rush or cornhusks were sewn together with bone needles and hemp thread. The splinter bones of a crane made fine needles.

The small door of the wigwam was also a mat or a piece of bark. An opening was left at the top for smoke to escape from the indoor fire.

These bark-covered houses looked like thatched huts huddled close to each other. They were often cold, smoky, and crowded in winter and hot and stuffy in summer.

Strong tribes had palisaded villages for protection against enemy attack. These villages were enclosed by a series of closely set tree trunks about twelve feet high.

The wigwam had one room. In it the family slept, cooked, ate, and worked.

Colorful mats decorated the inside walls. Hanging from the walls were baskets of all sizes and shapes made from any material at hand. There were baskets of bark, hemp, rush, woodsplints, cornhusks, tall grasses, or plant fibers. They were used like pantry shelves for storage. Women stored seeds, corn, dried meat, fish, paints, or other household items in them."

Before You Begin

Preparation: 1. An outdoor site is necessary for the construction of a wigwam.

2. Fall or spring is the best time of year.

3. A supply of saplings or branches, straight and bendable, about 8' - 10' each is needed for the framework: sixteen per wigwam, a few spares, and some shorter sticks for hole-fillers. They may be obtained from tree surgeons or road crews, gathered from construction sites or judiciously cut from a wooded area near your building site. Look for fallen trees, branches, or thickets that need thinning. Think before you cut. Avoid damaging healthy trees.

4. A covering is made of tree bark (taken from dead trees), grasses, leaves. Plastic sheets are useable, but not really authentic. Mats can easily be woven from grasses or reeds, a common example being phragmites. These reeds have long flat leaves, plume-

like flower clusters, and still stems. They are found commonly along lakes, salt marshes and ponds.

To make mats: Students work in teams of two:

a. Have students collect reeds about 5 ft. in length. Do not clear cut an area.

b. When ready to weave, cut the 5 ft. lengths in half.

c. Cut 6 ft. lengths of natural colored twine or wool. You will need 3 pieces per mat.

d. Lay out 20 reeds, and as one student weaves "over and under" (see diagram #1) the other assists by holding the reeds in place and lifting each reed in turn.

e. To hold the mat firmly, weave the reeds at each end, and once in the middle (see diagram #2).

f. Make as many mats as necessary to cover the wigwam.

5. Lashing materials to hold the frame together and the covering in place can be done with long grass, bark or vines. String, rope, tape and staplers also work, but not being natural source materials are less desirable for use.

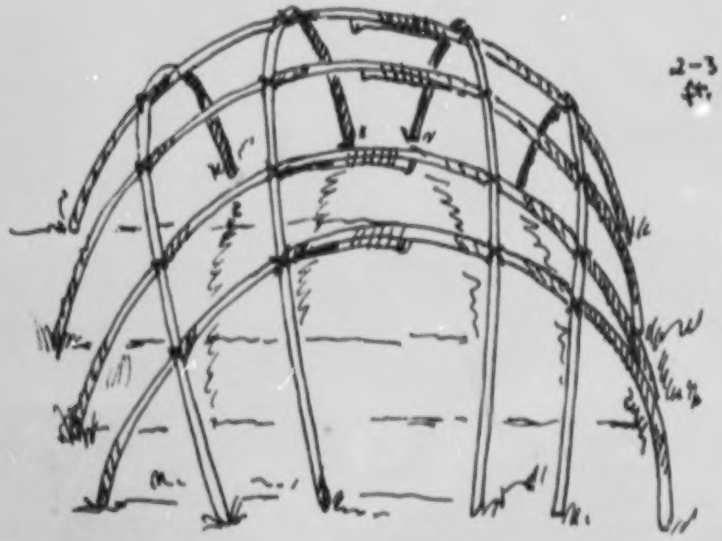
6. Other useful items: shovels, scissors, knives.

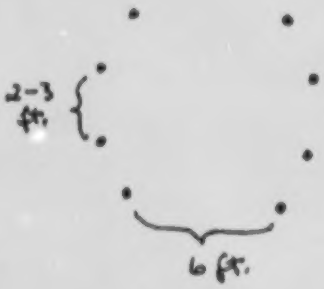
7. Devise a blueprint to share with your students. Here is a sample:

a. Dig holes and bury the fat ends of the saplings in two curved rows, 4 poles in each row, each pole 2 ft. - 3 ft. apart. Keep the row ends about 6 ft. apart. (see below)

b. Bend the poles together, lashing them in pairs (diagram #3).

c. Now bury 4 more poles at the "open" ends of the wigwam (on the X above). They will be 1 ft. - 2 ft. apart. Bend them together in pairs, lashing them together and to the other poles which they cross. Your framework should look like this:





(Step 7, a.)

d. Cover the frame with bark, grass mats, plastic etc. Leave a small smoke hole at the top, and devise a door for one end.

e. This is the basic wigwam. Low sleeping shelves can be built inside, and the wall covered with decorative materials either found in nature or made by humans: flowers, corn, squash, baskets, furs,shells etc. For warmth in the winter, the Indians piled sod around the wigwam, and added more bark or skin to its cover.

Words To Know

wigwam, culture, tribe, lash, natural environment.

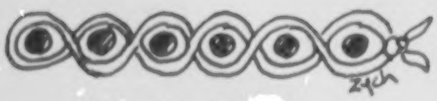


Diagram # 1

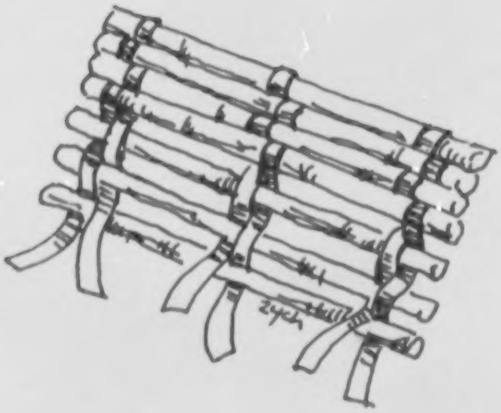


Diagram # 2

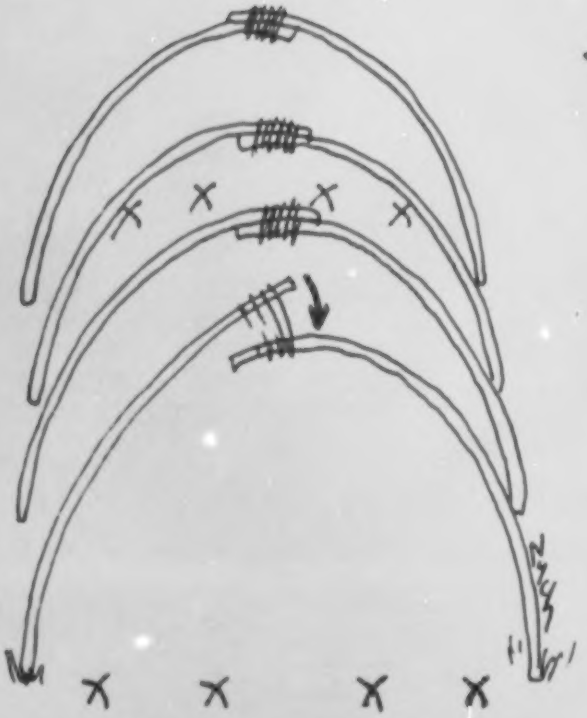


Diagram # 3

ACTIVITY

In class:

1. Ask students to make a list on the blackboard of things used by Indians constructing shelters.

2. Explain that all Indians did not live in teepees, but that some, like those from Connecticut, lived in wigwams.

3. Look at pictures of wigwams, and share your knowledge of them with your students.

4. Share the plans you have for construction and review them with the class.

5. Ask the students for suggestions for building sites and sources of materials.

6. Find a site, gather materials and build a wigwam according to instructions in the section, Before You Begin.

7. Make a list of materials used by the Indians for their wigwams, and a corresponding list of the purposes for which each material was used. Make another list of materials we use to build a home or apartment, and our purposes for using them. Compare materials and purposes. Discuss and contrast, with respect to the relationship between the people and their natural environment. How much technology is necessary to develop materials for their purposes?

8. When it is built to satisfaction, gather together in a large wigwam and discuss as a class:
    a. What kind of tools did you use? What did the Indians use?
    b. Was it difficult to build a wigwam?
    c. Would you like to live in one? What would you miss? gain?
    d. Did Indians need fancy tools or materials?

Related Activities

1. Cook an Indian meal near/in your wigwam.
2. Visit a museum which displays Indian life and culture.
3. Compare the tribes of Connecticut to other Indian tribes.

Resources

Siegal, Beatrice, Indians of the Woodland, Walker and Company, 1972.

Spellman, Kathleen, "How to Cover Your Summer Wigwam", Environmental Education Center, ACES, New Haven, CT, 1978.

Whipple, Chandler, The Indian and White Man in Connecticut, Berkshire Traveller, 1972.

Credit

Drawing: Cecelia Zych

Building an Indian Village

Curriculum Topic

NORTH AMERICAN INDIANS
GEOGRAPHY

Environmental Topic

ECONOMICS, TECHNOLOGY - CULTURE

Skills

Group skills, locating and obtaining information, organizing information, using information for a purpose.

Subject

Social Studies

Grade Level(s)

3-5

Site

Classroom, school grounds, home

Author

Antoinette R. Giovannitti
Arthur C. Braun, Jr.

Objective

Students will be able to:

1. describe how the environment affectd Indian lifestyle, particularly the design of their dwellings.

To The Teacher

The Indian's and early settlers of North America adapted their lifestyles to that which was locally and environmentally available. Through the study of the Indians and pioneers, one becomes cognizant of the fact that the environment dicated the site, type of dwelling, and materials used for construction of villages and towns.

The Southwest Indians of the deserts built permanent villages called pueblos of clay. They were farmers who were often raided by wandering, war-like tribes.

Northwest Coastal Indians were surrounded by forests, They used wood and bark for their houses, dishes, spoons, canoes, and even for totem poles.

Northeastn Woodland Indians lived in cone-shaped wigwams covered with bark. They built wooden houses 100 feet long called "long houses" for community use during long, cold winters.

Plains Indians lived in wigwams covered with bark or straw. They used the "teepee" while hunting buffalo. Originating in the eastern woodlands, the Plains Indians were driven to the plains by white settlers. The horse, the rifle and the buffalo gave them a new, more mobile kind of life.

The pioneers followed the same environmental pattern as the Indian. However, when they arrived in the "new world," they brought with them the technology and knowledge of a more sophisticated comfortable society. Therefore, the type and style of home they constructed was different from the natives of North America.

Through this activity the student should realize that man's environment has always played a leading role in the artifacts, occupations, clothing, food and rituals of a culture. The natural system influences the evolution of human culture.

Before You Begin

Materials: bases for village (masonite, plywood, or cardboard), glue, scissors (Materials for the villages will be collected by the students from the school grounds, wooded areas and/or home.) library books, fimstrips, and cassettes about North American Indians and early pioneers, Encyclopedia, filmstrip projector/screen, tape recorder and listening post.

Preparation: Designate a section of the room where materials can be kept while students collect them.

Words To Know

environment, Northeastern Woodland Indian, Plains Indian, artifacts, Southwestern Indian

Notes To Myself

ACTIVITY

1. Before learning about the Indians of North America, set out research materials consisting of library books, encyclopedias, filmstrips, and cassettes which deal with North American Indians or early pioneers.

2. Divide class into four or five groups and equip each with a base, glue and scissors.

3. Announce the assignment: Each groups is to build a pioneer or Native American Indian community for a specific area of the United States such as the Northeast, desert Southwest, prarie, South, Midwest, or Pacific Northwest.

4. Each group should research their assigned area to determine the construction materials which would have been available to people in that part of the country during the time period selected.

5. The following day take students outside. Students then can collect similar materials from the school grounds. (They could also bring in materials from home or other sources.) Encourage them to be creative as they search for representative sources.

6. Once the materials are collected, students build their community from these materials.

7. The community might include homes, smokehouses, outhouses, barns and perhaps a church or store.

8. When all the communities are completed, put them on display and lead a class discussion:

    a. What building materials were most common in the various parts of the country?

    b. How did available building materials influence the type of homes constructed?

    c. How did the available building materials affect the pioneer and Indian lifestyles?

    d. How is it possible that modern homes in the prarie states are built of wood?

    e. What materials are used to build modern homes? Are they a reflection of the particular geographic location? Why?

    f. Why aren't most modern homes built of sod or entirely of stone?

    g. How well do the different materials used insulate and protect against the elements? Which materials are more suitable for construction in certain climates than in others?

    h. What environmental impact has there been through use of various materials in home and other building construction?

Resources

Shapiro, Irwin, The Golden Book of America, New York: Golden Press, 1961.

Credit

"Start a City", Project Learning Tree, 1977, p 63.

The Colonial "Times"

Curriculum Topic

COLONIAL PERIOD

Environmental Topic

ECONOMICS AND TECHNOLOGY

Skills

Locating and obtaining information, using information for a purpose, communicating information, evaluating information, group skills

Subject

Social Science

Grade Level(s)

4 - 5

Site

Classroom, a major local newspaper plant (e.g. New Haven Register)

Author

Antoinette R. Giovannitti
Arthur C. Braun, Jr.

Objective

The student will be able to:

1. tell that the cost of producing a particular product includes such things as the resources used, wages of workers, advertising, taxes and improving working and environmental standards,

2. deisgn a chart of an organization's structure including department heads.

To The Teacher

During the early days of settlement of our country, the early colonists brought their specialties to the new world. In order to survive and to be a successful member of society these skills were used to form independent businesses. The basis of this new system of government was free enterprise. But in order for this system to be successful, the members had to know basic organizational and management skills.

Students must recognize that the early colonists had the same problems of starting a business as an individual has today. However, many factors influence the success and/or failure of a business. These are sometimes overlooked or never realized by young entrepreneurs. The top priority in business as in teaching, is organization and appointing good leaders (non-academically as well as academically inclined) who are competent and effective to head each department. This philosophy holds true in any business endeavor.

As an added note, most newspapers have newspaper units available to classroom teachers. Most encyclopedias will give material that will aide a teacher in gaining background information on the outlay and role of newspapers in America.

Before You Begin

Materials: ditto masters, ditto paper, graph paper, ditto machine, poster board/construction, magic markers, crayons, rulers dictionary, old newspaper

Words To Know

publication, features, editing, debit, commercial, standards, circulation, accounting, credits.

ACTIVITY

1. Discuss with the class the means of communication the colonists used for the acquisition of information. (Information was transferred by word of mouth, books, notices and newspapers. Basically they were dependent on each other and passing travelers because of the limited availability of books and newspapers.)

2. Ask the students "What topics do you think would have been of high interest to the early colonists?" (answers will vary)

3. What is the main source of communicating the greatest amount of information to the greatest number of people? (through the newspaper)

4. Announce to the students that we will set up our own colonial newspaper. Point out that running a newspaper is the same as running any business (e.g. blacksmith shop, general store, apothecary, etc.) The purpose of a business is to make money or earn profits. Our newspaper will be conducted in the same manner as a commercial newspaper but on a mini-scale. Monies will be needed (borrowed) to get us started. Wages will be set (optional) and profits will be made. (we hope!)

5. Guide the students into possible articles. (e.g. Who would you want to personally interview? George Washington, Paul Revere etc.) What event would you like to have covered at this time? (Boston Tea Party, Continental Congress, meeting of Minutemen, etc.) Discuss the need for all articles of an edition to be pertinent to a specific segment of the time line.

6. What departments would have to be set up for a colonial newspaper? (advertising, publishing, editing, editors (Co.), news, features, sports, entertainment, circulation, accounting, etc.)

7. Discuss each department and the jobs involved. Interest groups should be formed; department heads should be chosen.

8. Department heads should meet with the editor(s) to determine probable cost factors of advertising and of the final product. They should also discuss basic philosophy of the newspaper. The discussion outcome should be carried down to their subordinates.

9. Students should purchase all needed materials on credit from supply room or teacher (and set wages---if any). They should keep an accounting sheet, and statistics should be charted every day.

10. The advertising department should be buying time on the school P.A. system or putting posters in the halls.

11. After editing and publication, class should look at the financial outlay, including debts, and determine the cost of paper and volume to be circulated.

12. Circulation of newspapers, income, materials used, and expenses should be tabulated and charted.

13. Various conclusions should be discussed and ways of improving any future editions should be written down.

14. A discussion of the differences between our newspaper and a regular commercial newspaper should be conducted at this point. An understanding should be reached that commercial newspapers have to pay taxes on profits and meet certain environmental standards in their working conditions.

15. A final comparison of OUR environmental safeguards concerning OUR waste materials should be discussed in concluding this unit.

a. Consider the destruction and replacement of trees. (The processing plants that make it into paper, and the disposal of its unusable by-products; river pollution)

b. The energy used for transportation from logging camps to final circulated newspaper.

c. The need for recycling of the used newspaper. (Possible outcome of the discussion, should be to collect old newspapers for recycling purposes and use the products or monitary reward to alleviate the cost of producing the room newspaper.)

Resources

Encyclopedias, Social Studies text books

Credit

Stapp, William and Dorothya Cox, Environmental Education Activities Manual, Farmington Hills, Michigan, 1974, p. 47, "Classroom Newspaper".

Notes To Myself

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Trees Please

Curriculum Topic

COLONIAL PERIOD, AGE OF EXPLORATION, INDUSTRIAL REVOLUTION, CIVIL WAR

Environmental Topic

ECONOMICS & TECHNOLOGY - CULTURE

Skills

Recognizing problems, analyzing information, identifying alternatives, identifying feelings about alternatives

Subject

Social Studies

Grade Level(s)

5

Site

Classroom

Author

Karen Ann Hayward
William McCann

Objective

The student will be able to:

1. list the value of wood in man's society as it pertains to his technological growth throughout history,
2. list the aesthetic value of trees.

To The Teacher

This activity is easily infused into any historical time frame. There may also be value in repeating this activity several times during the semester to analyze the difference in technology during a variety of time periods.

Students are asked to consider the world without trees both past and present. This can be accomplished by examining a brief outline of world history and noting where history would have been different due to the lack of this valuable resource, trees. It is important to spend time on the present because students can relate to this more subjectively. In present day time frame, trees contribute to our lifestyle in many ways. A few examples are:

- pencils, paper and books
- maple syrup
- muscial instruments
- resins in shoe polish
- home construction
- heat
- animal homes
- prevents soil erosion
- shade

After reading the "Activity" section of the curriculum it should be stressed that this is a very general write up of an activity that could easily be altered for a more specific historical time frame. The Age of Exploration, the Industrial Revolution and the Colonial Period in this country are excellent periods to do a lesson like this because trees were such a vital resource during these times.

Forests are self-perpetuating resources even under heavy harvest if they are given proper care. But at present, only about 13 percent of the world's 9.8 billion acres of forests are under any sort of management. Besides their economic value, it must be remembered that forests have 3 vital functions: they act as watersheds, they affect the climate by absorbing heat and producing oxygen, and they maintain regional ecology including providing habitats for wildlife. Deforestation destroys ecosystems, erodes soil and creates danger of flooding.

The United States has cut down at least 50 percent of its forests since the seventeenth century. It has not been notably rational in the management of forest resources. It was not until the New Deal of the late 1930's that a timber policy began to take place.

Before You Begin

Materials: pencils, paper

Words To Know

deforestation, photochemical smog, coniferous trees, deciduous trees

ACTIVITY

In a class discussion:

1. What are trees used for in the time period you are studying?
2. Ask the students to imagine a world without trees in this time period. Describe this world.
3. Ask the students if history might have been changed.
4. How might our present world be different?
5. It would also be appropriate to have students attempt to see if any substitutions could be made for trees.

CASE STUDY

In Colonial times trees were used for:

1. houses
2. ships
3. heat

Without trees there would be no:

1. wooden or log houses
2. wooden ships
3. no trade

Related Activities

1. Take a nature walk and identify various trees. Discuss the diverse qualities of the trees (e.g. hardness of wood, suppleness) and try to decide what uses particular trees had during the historical period being studied.

2. Discuss timber damage to trees due to photochemical smog that gradually kills the leaves of a tree which dies when photosynthetic activity becomes inadequate. Pine trees seem most vulnerable, yet the smog affects other trees espeically around the Los Angeles area.

Resources

Greenwood, Ned and J. M. Edwards, Human Environments and Natural Systems: A Conflict of Dominion, Duxbury Press, North Scituate, MA, 1973.

Notes To Myself

Homesteader

Curriculum Topic

WESTWARD EXPANSION

Subject

Social Studies

Environmental Topic

ECONOMICS, TECHNOLOGY, CULTURE-

The relationship between man and the natural environment are indicated by culture.

Grade Level(s)

3 - 5

Site

Classroom

Skills

Collecting and assimilating information

Author

Cyndi Walsh

Objective

After the gaming experience, the student will be able to:

1. list the many environmental hardships suffered by the settlers of the plains, and

2. identify the factors which aided their survival.

To The Teacher

The following gaming experience increases student awareness of the environmental hardships suffered by the plains settlers during the period of American history known as Westward Expansion. The Homestead Act of 1862 began the last era of settlement in the U.S. The Act provided for the transfer of 160 acres of land to a homesteader who maintained residence on the acreage for a period of five years.

Previous to ratification of the Homestead Act, the Western plains were occupied mainly by cattlemen and indians, whose interest in the range was threatened by the arrival of the farmers. The homesteaders, urged on by the promise of free land, arrived at their destination little expecting fierce weather, arrid land and fiercer neighbors.

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In this activity, students play the role of homesteaders. Each student decides how to manage his/her acreage considering the hardships of the land and the vested interests of the cattlemen.

Before You Begin

Caution: Adjust the game time to the players' interest spans.

Materials: books on Westward Expansion, index cards, pencils, paper

Words To Know

Westward Expansion, homesteader, Homestead Act

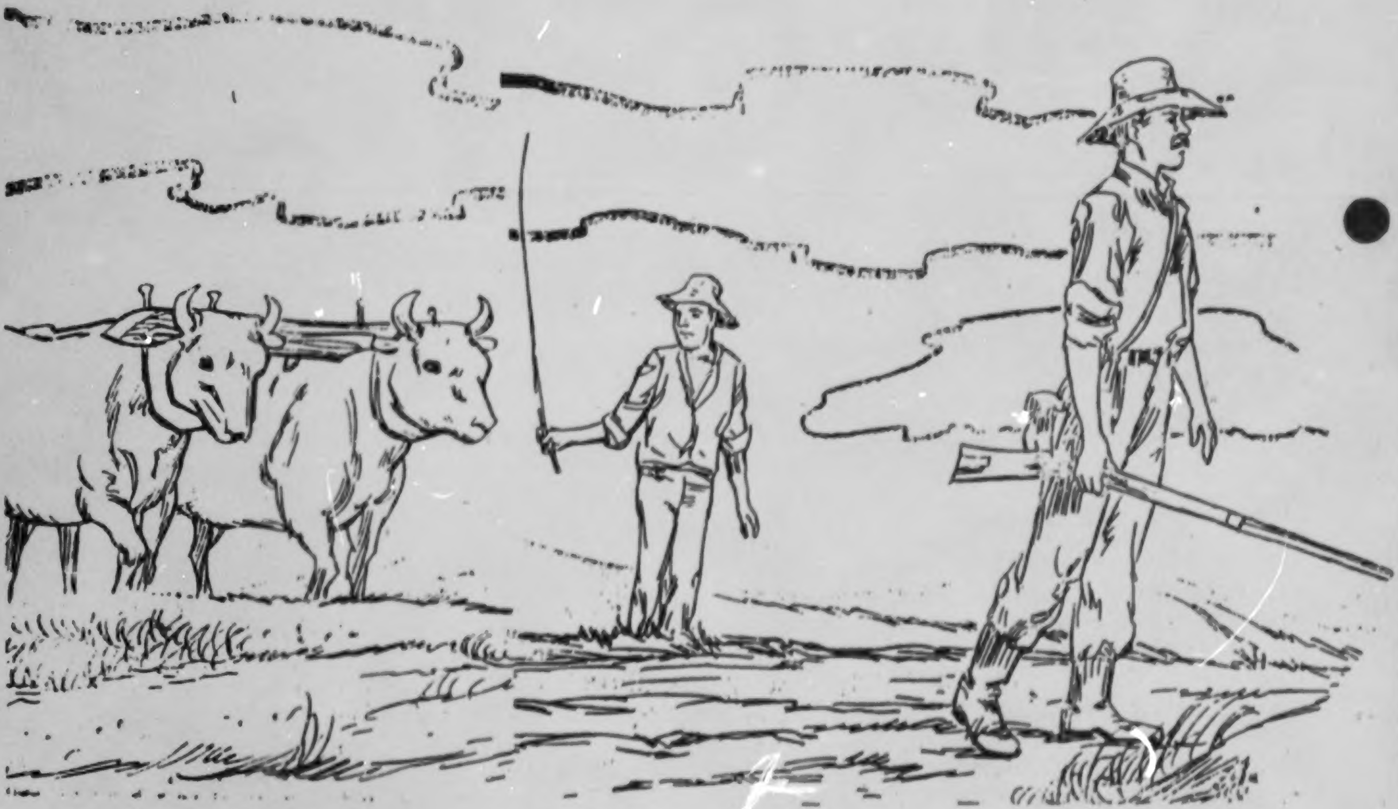

Illustration from The Environment and You, by Matthew J. Brennan, Grosset & Dunlap, pub. EEC no. 1349.

ACTIVITY

1. Plan a research session for the students. They will read for information on the various experiences of plains homesteaders.

2. Compile with students a list of environmental conditions which challenged the adaptive skills of the settlers. Then discuss how the settlers coped or might have coped with these conditions. Consider these environmental and social factors: weather (blizzards, droughts, dust storms, tornadoes, floods); natural resources (no trees, scarce water to generate power or irrigate crops, unplowable sod); and economic conditions (land swindlers, wars between cattlemen and farmers, introduction of the railroad).

3. The students will then rank each of these factors on a scale of difficulty to solve (1-least difficult to meet, 5-most difficult).

4. Now assemble a set of playing cards by putting each hardship on an index card. In the corner of the card, note the ranked value of the hardship. You may need multiple copies of each hardship. The entire deck should be twice the number of students in the class.

5. Play begins by asking students to derive as many words as possible from the sentence, "The Homestead Act was passed during the presidential term of Abraham Lincoln." A round of play may last one minute. When time is up, students will determine their scores by totalling the number of words they made.

6. Each student then picks a hardship card from his/her deck. Deduct the hardship value from the score earned in the word makeup. Reuse hardship cards as necessary. Continue play until a player accumulates 20 points.

ALTERNATIVE GAME

1. Following the research session, students will compile a list of ten problems faced by homesteaders. Students then compile a matching list of ten solutions. Make a complete deck of playing cards (index cards) consisting of 10 PROBLEM CARDS and 10 SOLUTION CARDS. Label the back of each card PROBLEM or SOLUTION. Duplicate enough decks to provide one complete deck for each pair of students in the class.

2. To play the game, begin by shuffling the PROBLEM CARDS. Shuffle the SOLUTION CARDS. Place a stack of PROBLEM CARDS (10) and SOLUTION CARDS (10) between each pair of players. On the first turn, player one chooses a card from the PROBLEM stack. Player 2 then chooses a card from the PROBLEM stack. On the next turn, players choose from the SOLUTION stack. Players continue choosing cards from alternate stacks until one player is able to make a match between a PROBLEM and a SOLUTION. Set a time limit.

Related Activities

1. Follow-up discussion could include the technological and industrial advances that enabled the Plains farmer to survive life as a sodbuster.

2. Find out how this trial-and-error approach to survival resulted in the creation of the dust bowl.

3. Dramatize life of a sodbuster.

Resources

Any American History Textbook.

Credit

Ann-Marie M. Fleming, contributor

Notes To Myself

What Can We Turn Off

Curriculum Topic
CITIZENSHIP; URBAN STUDIES

Environmental Topic
ECONOMICS, TECHNOLOGY, CULTURE

Skills
Organizing and using information for a purpose
Clarifying values

Subject
Social Studies

Grade Level(s)
3 - 5

Site
Classroom, home

Author
Sandy Price

Objective

The children will be able to:

1. demonstrate an awareness of their lifestyles
2. list their preference for play activities
3. associate play activities with electrical energy consumption
4. give up one electricity-consuming activity and reflect on this experience with each other.

To The Teacher

Whereas the U.S. accounts for only 1/16 of the world's population, this country consumes 1/3 of the world's energy.

We are running out of cheap oil and natural gas to produce energy in the form of electricity. Nuclear power plants produce dangers to the environment that have not been resolved. We are now forced to think in terms of conservation: less use, less waste.

As consumers, we can become more aware of the quality of our lives with respect to energy use.

> "Turn off the lights; in the silence of your darkened home
> you can hear a thousand rivers whispering their thanks."
>
> - Clear Creek

Before You Begin

Time Involved: Week one - 10 to 15 minutes in class - children make a list of play activities as homework.
Week two - 45 minutes in class

Words To Know

electrical energy, conservation, consumption

SEE ACTIVITY ON NEXT PAGE

Related Activities

The children make a list of all the home appliances, tools and entertainment sources which are dependent upon electrical energy. The students then involve their families in an energy-saving experiment, such as spending a weekend at home without the benefit of non-essential electrical appliances. Or, the family uses alternative energy-consuming devices.

Credit

"Can You Dig It?" Project Learning Tree, American Forest Institute, Inc., 1977

Miller, G. Tyler, Jr., Living in the Environment: Concepts, Problems and Alternatives, Wadsworth Pub., Co., Inc., 1975 EEC #B79

Notes To Myself

ACTIVITY

1. Data collection:

   Tell the children that they are going to participate in an experiment in which they will learn more about themselves. The first thing they will need to do is to collect some facts. They are to record, for one weekday and one weekend day their relaxation-play activities.

2. Data organization (in class):

   With their lists before them, the children then star all the activities which use electrical energy.

3. Data analysis:

   Help the children compare their data. They will count the number of activities which were chosen most often. How many take place outdoors, indoors, with a friend, alone, etc.?

   Then count the number of favorite activities which involve the use of electricity?

4. Define the problem:

   Now, invent a situation which results in a cut-back of available energy. Sometimes such a situation is created by weather factors - a cold spell results in a shortage of coal or oil and a hot spell results in a drain on the electrical power supply. Or, there may be a danger of pollution from a local generating source, or the family decides to conserve energy in an effort to save money.

5. Alternate Solution & Valuing:

   Brainstorm again about what they could do about their favorite activities if they needed to conserve energy.

   Now have the students choose one activity from their list. This activity must require electricity and be something easily given up by the student for one week.

6. Implementing:

   For one week the children will "go without" this energy-consuming activity.

7. Discussion:

   a. Did you feel deprived without this activity?
   b. When was it hardest not to do it?
   c. What did you do instead?
   d. What else could you have done?
   e. Were you aware of other people doing your activity?
   f. Would you be willing to continue to go without this activity or limit it and under what circumstances?
   g. How do you think people in general can be persuaded to use less electrical energy?

Make The Tree Last

Curriculum Topic

CITIZENSHIP

Environmental Topic

ECONOMICS & TECHNOLOGY - CULTURE
RESOURCES - ENERGY
ENVIRONMENTAL POLICY
ENVIRONMENTAL ETHICS

Skills

Collecting data, recognizing problems, developing a plan of action, identifying alternatives, identifying feelings about alternatives, groups skills, citizenship skills

Subject

Social Studies

Grade Level(s)

3-5

Site

Classroom

Author

Sandy Price

Objective

The student will be able to:

1. decide what paper they throw away can be used again.
2. list ways that they can reuse paper generally discarded.

To The Teacher

Our lives abound with paper products: towels, napkins, diapers, paper bags, milk cartons, many layers of packaging of items we buy, etc. Over half of all our solid waste is paper. Each person in the U.S. uses 560 lbs. of paper/year. We throw away 20 million tons of paper every year. It is estimated that by 1980 we will be using trees faster than we can replace them.

Some waste paper is recycled. New paper can be made from the old after cleaning , chopping, moistening, reconditioning and repulping take place. Recent uses for recycled paper include home insulation, cereal and detergent boxes, newsprint, wallboard. But most of our paper goes into the garbage, is buried in landfills and dumps or is burned in incinerators.

Students study about our use of diminishing natural resources and the problems of waste and pollution and how cities deal with these problems.

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This lesson confronts students with their own waste of paper. The results of their "throw-aways" will be evident, and they will be able to see (even among the small number of people in their classroom) how a little waste on each person's part builds up.

While many of the problems of cities and states that children study about are too big for them to conceive or affect, they can change their personal patterns of using paper. They can have an experience of good stewardship with respect to one of our natural resources.

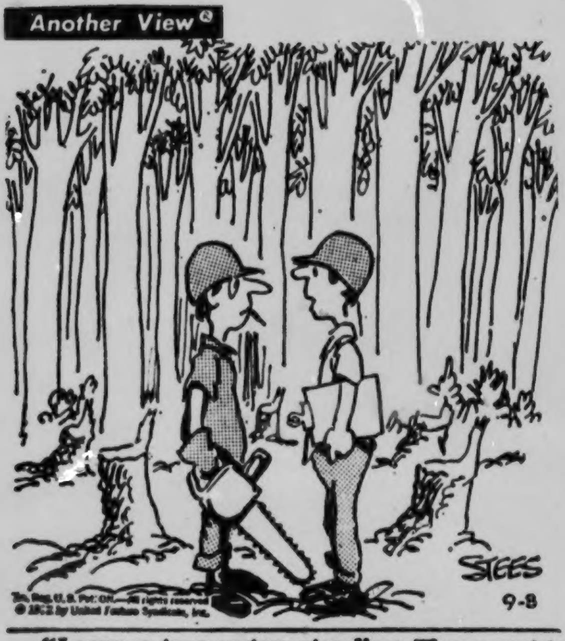
Before You Begin

Materials: cardboard boxes or other bins to collect and later to sort paper trash in, scales.

Collect the papers from the classroom wastebasket for one week. Place a large box in the rear of the room to hold the daily collection. Don't tell the class what you are doing. It will change their normal habits. Finally, explain to the custodians what you are doing so they do not toss your collection.

Words To Know

recycle



"Leave a tree or two standing. They want to call this section Elm Forest."

By permission of United Feature Syndicate, Inc.

ACTIVITY

1. Collect the waste paper from hour classroom for one week. Each evening place the paper from the wastebaskets into a box marked SAVE.

2. After the paper is collected and before doing anything with it, ask students questions to get them involved, for example:

    a. How many pounds of paper do you think each person uses in a year?

    b. List the kinds of paper trash thrown out in your home.

    c. Where do you think most of our paper trash goes?

    d. Why do community organizations have paper drives?

    e. What happens to the paper we usually throw in the trash in our school room?

    f. What is recycled paper?

3. Explain that the class will investigate all the paper thrown away for a week in the classroom. The object is to determine whether we wasted paper ourselves.

4. If possible, weigh the paper collected.

5. Divide the trash into 3 or 4 bins so that students can work in smaller groups.

6. The children are to sort the paper into categories:

    a. Completely used.

    b. Paper that is not completely used.

    c. Unused paper.

    d. Other categories the students might decide on.

7. Estimate or measure the amount of paper in each category by weight or volume.

8. Discussion questions:

    a. Compare the amount of reusable paper or unused paper with the completely used paper. These three kinds may be compared be weight.

    b. Illustrate different ways partially used paper might be utilized (practice spelling words, figure math problems, book markers, art projects, etc.)

    c. How could we organize places in our room to collect different kinds of reusable paper?

    d. Are we willing to try to reuse paper?

    e. What will be the advantages?

    f. What might be the difficulties in doing it?

    g. Where does paper come from? It is made from the fibers of trees.

    h. What effect would it have on the trees if we reused the paper?

Related Activities

1. Have some students give a presentation to other classrooms telling them about the experiment and urging them to try it and also conserve paper.

2. Make a display of different kinds of waste paper and ways it can be reused.

Credit

Miller, G. Tyler, Jr., Living in the Environment: Concepts, Problems, and Alternatives, Wadsworth Publishing Company, Inc., 1975, EEC #B79.

"Classroom Conservation", Project Learning Tree, American Forest Institute, Inc., 1977, EEC #84.

Notes To Myself

Why Drive That Car?

Curriculum Topic
URBAN STUDIES

Environmental Topic
ECONOMICS, TECHNOLOGY & CULTURE
ENVIRONMENTAL ETHICS

Skills
Locating and obtaining information
Using information for a purpose

Subject
Social Studies

Grade Level(s)
3-5

Site
Classroom

Author
Sandy Price

Objective

The student will be able to:

1. list reasons offered by users and advertisers for using automobiles.

To The Teacher

Social Studies texts include material on problems of traffic and air pollution. This lesson will give the children an opportunity to investigate driving patterns and attitudes towards driving in their community. They will then have their own data which will be more meaningful to them as they explore problems and solutions to auto traffic problems.

There are over 100 million cars, trucks, and buses in the U.S. That means there is about one vehicle for every 2 persons. Moreover, half the cars in the world belong to Americans.

The leading cause of air pollution in our country is from the internal combustion engine in motor vehicles. More than half of all air pollution is from motor vehicles. Eighty-five (85) percent of the air pollution in cities is caused by cars and trucks.

The effect of this pollution on people is lowered resistance to such diseases as bronchitis, lung cancer, heart disease, and emphysema (the fastest-growing cause of death in our country).

Another toll of all the traffic is that 60,000 persons are killed and 2,000,000 injured in accidents yearly.

The automobile industry is central to the entire economic sturcture of the U.S. One dollar ($1.00) out of every five dollars ($5.00) is spent on the auto industry or its supporting industries.

Pollution-control devices cannot be perfected to eliminate pollution and very likely would soon be rendered ineffective against the increased numbers of cars. Auto engineers augue that control devices are too costly and that automobile users would be reluctant to accept another form of power for their cars.

A car uses 5 times as much fuel as a bus and 10 times as much fuel as a train.

Each year we expand our population by 2 million people and our number of motor vehicles by 4 million.

Do people know what they are driving towards?

What do people value in their cars?

Before You Begin

Materials: paper and pencil, chalkboard, people to interview outside the classroom

This lesson will require two class periods and data collection time outside class.

Words To Know

air pollution, survey

Resources

"Environment and the Quality of Life, Energy-Society", CBRU, New Jersey State Council for Environmental Education.

Miller, G. Tyler, Jr., Living in the Environment: Concepts, Problems, and Alternatives, Wadsworth Publishing Company, Inc., 1975, EEC #B79.

Sorvall, Vivian, Air Pollution: The World's Exhaust, Pendulum Press, In Inc., 1971, EEC #B23.

Wentworth, Daniel F., et al, Pollution: Examining Your Environment; Mine Publishing, Inc., 1971, EEC #B42.

Credit

Senesh, L., Cities, Teacher's Resource Guide, SRA, 1973.

ACTIVITY

Day One

1. Begin by asking the children to give their responses to information on motor vehicles and their problems.

a) For example, say: "What do you think is the leading cause of air pollution?" "How many cars do you think there are in the U.S.?" "What are the results of air pollution?", etc.

b) List all their responses on the board.

2. Now give the students some facts.

3. Encourage a discussion about why people want to have so many cars and why they drive so much. Again, list their ideas on the board or on a piece of large newsprint.

4. With the class, devise a questionnaire to sample people's car driving habits. Suggested items might be:

a) When do you drive? always_____, often_____, sometimes_______, never_______.

b) How do you get to work?______, shopping?________, school?__________ friends?___________.

c) Is it essential for you to drive?

d) Could you go without a car?

e) Is there a bus or train available? Do you use these? Why? Why not?

f) How many miles do you drive?

g) Do you drive in a car pool? Why? Why not?

h) How many cars are in your household? How many drivers?

i) Why do you like the car(s) you have?

j) Why do you like to drive **places?** Would you prefer not to drive?

k) Do you have any reasons why people should cut down on driving?

5. Duplicate the questionnaire and help the children choose a sample group (perhaps their parents and/or neighbors).

Day Two

1. Summarize and discuss responses the children have gathered in their questionnaires. For example:

a) To where do most people most frequently drive?

b) Are people carpooling?

c) How many cars do most households have?

d) What alternatives do people have to driving? Do they use them?

e) Why do people like or not like using their cars?

f) What are the costs and health hazards of driving cars?

g) How can the use of the automobile be cut down?

Related Activities

1. Children may make a T.V. commercial to advertise other modes of transportation.

2. Collect ads for cars in magazines to find reasons given consumers by industry advertisers for buying particular cars. Post results.

Advertising and Product Demand

Curriculum Topic
CURRENT EVENTS

Environmental Topic
ECONOMICS AND TECHNOLOGY

Skills
Locating and obtaining information; organizing information; using information for a purpose.

Subject
Social Studies

Grade Level(s)
3 - 5

Site
Classroom

Author
Arthur C. Braun, Jr.
Antoinette R. Giovannitti

Objective

The student will be able to:

1. explain how businesses create demands for products through the use of advertising.

To The Teacher

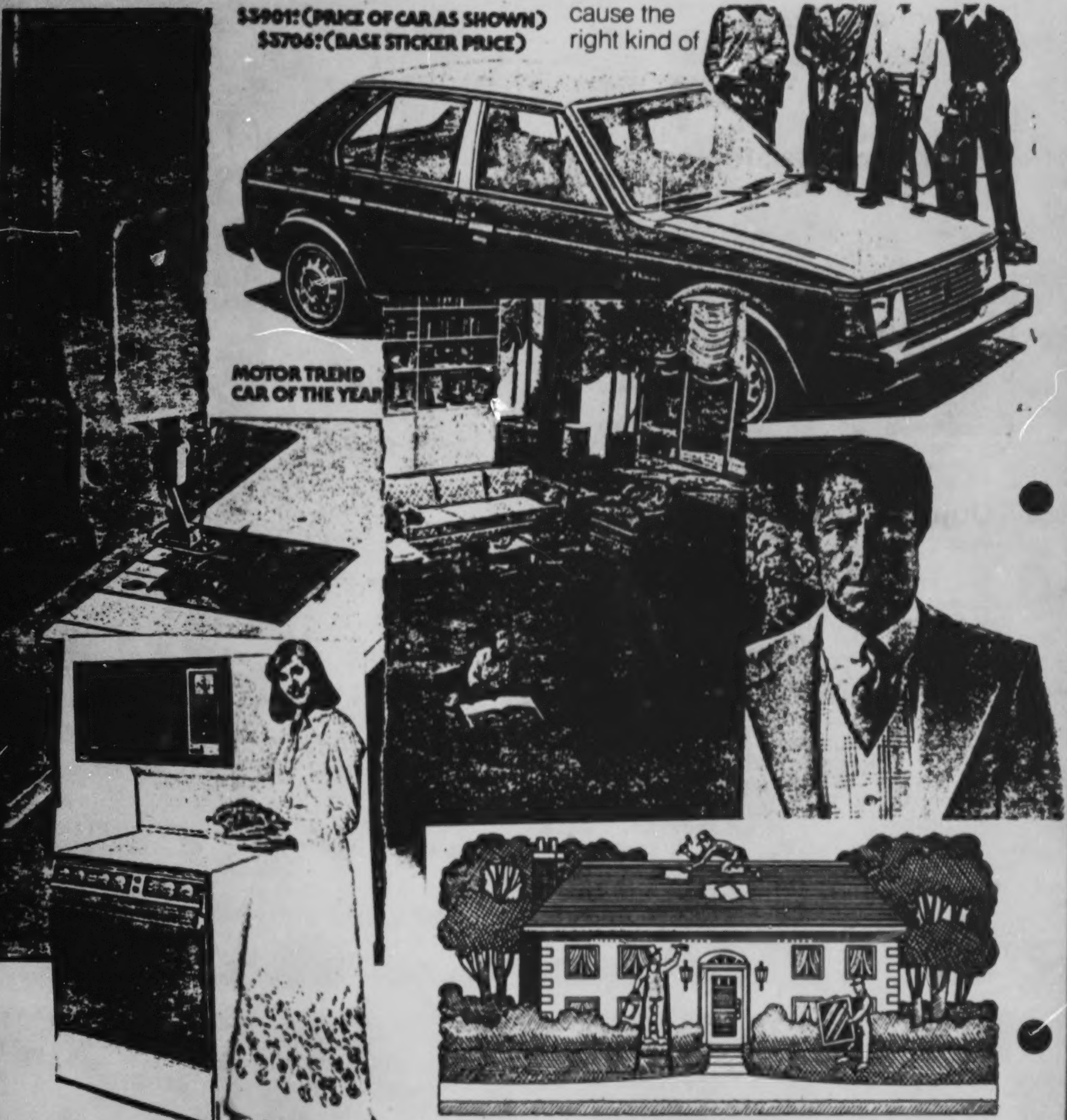
Advertising has always played an important role in our society. Early colonists used tins decorated with information to hold teas and other products. Signs were aesthetically designed to appeal to the populace, and advertisements were placed in newspapers to show the worth of the product.

Today advertisements are still used to convince buyers to select specific company products. Through advertising businesses create demand for their products. Increased product demand means increased business profits. Businesses help cities to grow by affording employment to many people and by sharing the tax load, thereby alleviating or lessening citizen taxes.

However, advertising has not only shaped but also defaced America. Magazines, newspapers, T.V. ads and billboards have caused our environment to suffer through increased solid waste problems and visual pollution. Advertising convinces consumers to buy products that are smartly styled and attractively packaged by presenting the product to the public in an appealing manner. But these products are often over-packaged and therefore waste paper.

Before You Begin

Materials: old newspapers and magazines (women's, men's, hobby, travel, fashion, news, etc.)
several large sheets of poster paper, paste, scissors for each student


$3901!(PRICE OF CAR AS SHOWN)
$3706!(BASE STICKER PRICE)
cause the
right kind of
MOTOR TREND
CAR OF THE YEAR

ACTIVITY

1. Have the students look through the magazines to find advertisements for products that they would like to own, now or as adults.

2. The students should cut the ads out and make collages by pasting them on the poster paper.

3. Have them make a list of ten products they would like to own whether shown in one of the ads or not.

4. Discussion questions:

   a. Ask students to explain the reasons for choosing certain advertisements. What was it about the advertisement that suggested that the product would be good to own?

   b. Find an advertisement for cigarettes. What else is shown in the ad besides the product itself?

   c. Do any of the ads show the product as it is being made? Why or why not?

   d. Do any of the ads tell you about problems associated with the product? (auto wrecks, injuries to the user, high energy consumption, etc.) Why or why not?

   e. Does advertising play a large or a small role in helping you decide what to buy?

   f. Who pays for advertisement?

Related Activities

1. Divide class into small groups to discuss the most effective mode of advertising: television, billboards, radio, or printed materials (newspapers, magazines, books.)

Credit

Wilhite, Richard H., in Stapp and Cox, Environmental Education Activities Manual, Farmington Hills, 1974, p. 45.

Notes To Myself

Almost Out of Site

Curriculum Topic

SELF-AWARENESS
The faster your travel speed, the more slurred your awareness of the natural world.

Environmental Topic

ECONOMICS, TECHNOLOGY & CULTURE

Skills

Observing

Subject

Social Studies, Science

Grade Level(s)

3-5

Site

School ground, a local yard
Field or woods

Author

Paul Sanderson

Objective

The student will be able to:

1. examine a defined area over 3 different periods of time,
2. compare and contrast their findings of the 3 observations,
3. suggest that the slower you go the more you observe with your senses.

To The Teacher

We live in a culture of speed. The ability to move from one place to another quickly is greatly valued. For some of us ease of mobility is almost a necessity. Unfortunately, it seems that the faster we travel, the further we get from the natural world, and from a close awareness of our environment. It is an expensive price to pay. If there is health, beauty, and enjoyment to be found in our natural environment, we stand much to lose by dulling our senses to these experiences.

Before You Begin

Materials: small hand trowels, hand lens,,paper and pencil, a stop watch or watch with a second hand.

Preparation: You will need several natural areas near your school These may be fields, yards, woods, ditches, ponds, beaches, etc. Select enough areas to comfortably accommodate the number of students in your class. Set boundaries for each area using flags, rope, or maps. Keep the areas small (10' x 10' to 40' x 40') and fairly uniform in size.

Words To Know

sensory awareness, observation, transportation, site, environment

SEE ACTIVITY
ON NEXT PAGE

"God's Country? Well I suppose it is. But I own it."

Conservation
News

Related Activities

1. Ask the students to write a list of things that they see and are aware of on their way home from school. Do this activity without preparation. When the students go home, they will compare what they observe with the list of observations they made in class. Discuss the results the next day in class.

2. Make awareness observations from a seated position on the ground. No moving allowed.

3. Make awareness observations using only one sense: touch, taste, hearing, smell, etc.

Resources

"Creep Up On Nature", Wildlife Notes, National Wildlife Federation, Washington, DC EEC #69.

Credit

The inspiration for this activity came from Colin Fletcher's The Complete Walker.

ACTIVITY

1. Divide your class into teams of 2-4 members each.

2. Equip each team with a hand trowel, hand lens, paper and pencil.

3. At the observation sites, challenge teams to note everything on the site within a limited time period. Teams will make observations and recordings using the tools provided them.

4. Set a time limit of 10 seconds. When time is up, assemble the class and leave the areas.

5. Repeat the observations for 100 seconds (1 minute, 40 seconds) having each team return to the areas where they made their first observations. Assemble the class and leave the area.

6. Return to the sites and repeat the observations for 1000 seconds (16 minutes, 40 seconds).

7. Return to the classroom. Each team will make three observation lists, including objects, sounds, smells, processes, temperatures, etc. There will be one list for each observation period.

8. Study the lists for a few minutes, then discuss:

   a. What did you see in the 10 second period? big things, obvious things

   b. What did you see in the 100 second period? smaller things, more detail, individual characteristics, activities and interactions.

   c. What did you see in the 1000 second period? many small, detailed things, colors, shapes, sizes, individual characteristics, complex activities, processes and interactions, sounds, smells, textures.

   d. Does your perception of the environment increase when you have more time to study it?

   e. Make a list of the activities you try to rush through in a day. Now make a list of the activities on which you spend much time.

   f. What is the fastest form of transportation? (aeroplane, space travel) What do you see hear, feel, smell as you travel in an aeroplane? In a train? Boat? Car? On a bike? What do you experience when you walk? Creep or crawl?

   g. What forms of travel give you the most chance to observe your environment? Least?

   h. What form of travel do you use the most? How many hours per day?

Notes To Myself

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What's in a Name

Curriculum Topic

SELF-AWARENESS AND CAREERS
surnames are a reflection of your ancestors culture and environment

Environmental Topic

ECONOMICS, TECHNOLOGY AND CULTURE
The relationship between humankind and the natural environment is mediated by the surrounding culture.

Skills

Information skills - locating and obtaining information, using information for a purpose, communicating information

Subject

Social Studies

Grade Level(s)

5

Site

Classroom, Library

Author

Paul Sanderson
(son of Alexander)

Objective

The student will be able to:

1. gather information about his/her surname.
2. suggest some of the cultural/environmental circumstances from which the name may have been derived.

To The Teacher

A student's surname is a good vehicle for introducing him/her to the concept of the influence of cultural/environmental background on their ancestors. A name may reflect a specific environmental setting or location (Schwartzberg - from the German meaning black mountain), an occupation (Miller, one who runs a mill), a particular personality trait (Dronkart, a drunk). By researching their surnames, students can learn about the relationships between humankind and the environment, both natural and cultural.

Before You Begin

It is vital to have a good sourcebook for the meanings and origins of surnames. Your librarian can help you locate several. Suggested sourcebooks are found in the Resources list at the end of the activity. A variety of sourcebooks is a valuable asset to this activity. You should be familiar with the usage of these sourcebooks before presenting the activity to the class. One method is to research your own surname and share this information with your students.

Materials: paper, pencils

ACTIVITY

1. Introduce the activity by explaining that everyone's name has a special meaning. Share the information you learned about your name.

2. Demonstrate to the students how to use the particular source books you have available.

3. Discuss and research other familiar names, such as the school principal, the president's etc.

4. Ask students to research their own names and to find information on the nation of origin, language, era, and meaning of the name. Ask them to look for connections with the natural or cultural environment (location, occupation).

5. Ask the students to prepare a short paper relating the information they have researched.

6. The class may share their individual findings in a discussion including questions:
    a. Where does your name come from? (country, language)
    b. What does your name mean?
    c. What environmental/cultural circumstances does the meaning suggest?
    d. Does your name suggest what your ancestors were like? How they lived? What their environment was like?
    e. Why did your ancestor's name refer to natural objects?
    f. Compare the meaning of noted opponents' names (i.e. Nixon and Humphrey).

Related Activities

1. Do a study of family genealogy. Study other family names.

2. Create a surname for yourself today. Consider your present environmental/cultural situation.

3. Investigate given names, and their reflection of individual personality traits.

Resources

Lamber, Eloise and Mario Pei, Our Names, Where They Came From and What They Mean, Lothrop, Lee and Shepard, Co., New York, 1960.

Smith, Elsdon C., American Surnames, Chilton Book Co., Radnor, PA, 1969.

Words To Know

surname, vulture, natural environment, research

Capturing Urban Blight on Film

Curriculum Topic

URBAN STUDIES

Environmental Topic

ECONOMICS, TECHNOLOGY & CULTURE

Skills

Information skills: Using information for a purpose, communicating information, evaluating information

Subject

Social Studies

Grade Level(s)

3-5

Site

Downtown area of a major city

Author

Antoinette R. Giovannitti
Arthur C. Braun, Jr.

Objective

The students will be able to:

1. recognize urban pollution.
2. organize data collected on city pollution.
3. evaluate the cost of city pollution as compared to the cost of restoration.

To The Teacher

Urban areas are the lifeline of society - the central locations of our technological and economic developments. They provide for its inhabitants a diversified range of opportunities in the cultural arts - theatres, museums, art galleries, and libraries. While cities are able to meet the needs of the culturally minded, they are unable to meet the needs of residents seeking a "better way" of living. Air and noise pollution, litter, etc. have sent people to the suburbs for improved living conditions.

The trend to date, is to salvage the city from further decay and blight spanning the last century, and to refurbish and restore priceless architecture that exists in its center. Restoration of run-down buildings which were formerly mansions and estates, better planning of shopping areas (e.g. malls), and the relocating of heavy industry to industrial parks leaving city centers exclusively with light industries, are seen as lures to entice people back to urban neighborhoods.

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This activity will show that the need of renovating a city to a more liveable condition involves a cost factor, whether it is dollars and cents or lives:

1. Monetary
    - a. repainting homes and cars (air pollution)
    - b. restructuring buildings (sound/air pollution)
    - c. cleaning of parks, streets, sidewalks (litter pollution)
2. Non-Monetary
    - a. physical health (air pollution)
        1. eyes - irritation
        2. lungs - asthma, empheysema
        3. ears - deafness
    - b. mental health (coping with all the pollutants)
        1. visiting a psychiatrist or doctor

Before You Begin

Materials: cameras, slide film, slide projector, screen, school bus.

Caution: To avoid duplication of pictures have students break up into 4 teams and elect a team leader. Teacher should preview street areas that best exemplify blighted and restored conditions.

Plot out 4 sections of the city to be photographed. Assign one section to each team. During the trip the teams that are not photographing can suggest to the photographers what should be captured on film. At the conclusion of the planned segment, independent photos can be made as students are returning to the starting point or to their awaiting bus.

Words To Know

litter, visual, physical, peeling, deteriorate, mental health, deafness, urban, rural, blight, billboards, discomfort, odors, photograph, duplicate, preplanned, calculate, intangible.

ACTIVITY

1. Discuss and list on blackboard class responses to the following:

   a. What are the kinds of pollution? (air, water, solid waste, noise, visual etc.)

   b. What are some of the results of pollution? (accept what students offer - aiming for some of the following:

      1. poor physical health
      2. plant damage
      3. peeling and deteriorating paint
      4. poor mental health
      5. deafness

2. Preparations for trip to urban area should include:

   a. Discuss the use of the camera (focusing, centering, holding camera still, advancing film forward, etc.)

   b. Discuss pollution problems to look for in the urban area. Consider these additions to the class discussion - billboards, signs over stores, store windows, air conditioners, (heat, discomfort, dripping water during warm weather), and any other "eye-sores."

      Other pollutants to be considered should be loud noises (drilling, buses, cars); odors)(e.g., fumes,factory smokestacks, bakery shops, street construction); animal excretions, etc.

3. Have students break up into at least 4 teams. Each team will be assigned an area to be photographed. (section #1, 2, 3 or 4). Explain to the students the purpose of the assignment so that wasted photos are minimal.

4. During the trip to urban area:

   a. Walk around urban centers or take school bus to pre-planned areas.

   b. Have students look at and photograph signs of urban blight or restoration.

5. After returning to the classroom, consider pollution results that were not photographed directly (mental health, poor physical health, odors, noises, etc.)

6. After the slides are developed, form a committee (team leaders) to organize the slides for presentation.

7. Project slides and discuss the blight and restoration shown. Have students calculate actual costs of harm caused by pollution. For example, because of air pollution houses have to be painted every 2-3 years instead of every 4-5 years. Car paints become impregnated with dirt particles and to be washed more frequently, if not repainted. Because of inconsiderate citizens, large amounts of litter has to be cleaned up and removed by additional maintenance personnel. Pollution causes people to: move to the suburbs where pollution is lessened; seek doctors' offices for mental coping; pay physicians who treat irritation of the eyes, nose, and skin. This can then be compared to the approximate cost of restoration and renewal of the city.

Related Activities

1. Set up slide presentation to show other classes.
2. Brainstorm ways that the class could improve the city.
3. Talk to the city council or the mayor for information regarding improvements which are being considered in the city.

Resources

Fox, Ruth, "Photographic Essay of Urban Blight", Stapp and Cox Upper Elementary, Vol. IV, p 61-62

Notes To Myself

239

A Different Ride

Curriculum Topic

URBAN STUDIES: Problems of Cities, Geography, Maps

Environmental Topic

ECONOMICS, TECHNOLOGY & CULTURE

Skills

Organizing information, using information for a purpose, reading and interpreting maps, group skills

Subject

Social Studies

Grade Level(s)

3-5

Site

Home, classroom

Author

Sandy Price

Objective

The student will be able to:

1. locate on a map the traffic routes most frequently used in the local community.

To The Teacher

There are over 100 million cars, trucks and buses in the U.S. today: approximately one (1) motor vehicle for every two (2) persons. Half the cars in the world are owned by Americans.

We build highways at a phenomenal rate and cost. One sixth (1/6) of our GNP goes into cars and road building each year. Highways in the U.S. now cover an area sufficient to pave Vermont, New Hampshire, Connecticut, Massachusetts and Rhode Island. Road building is the biggest construction business in the country. Gasoline taxes to states pay 90 percent of the states' share of construction. The highway lobby is one of the most powerful in the country.

More highways attract more cars, and the problem spirals. Existing mass transit systems lose money (200 systems defunct since 1963).

Some cities (e.g. San Francisco) are planning and/or building region-wide mass transit systems. These involve a network of buses, trains, and even ferries. Such projects are supported by increased parking fees for cars, free bus travel, the banning of cars from certain areas, the halting construction of new highways, etc.

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With people widely scattered in suburban areas, there need to be links to major transit arteries. Dial-a-Ride bus systems provide such a link, giving door-to-door service for 25-60 cents. Automobile expenditures , on the other hand, reach approximately $1.00 per mile.

The costs are, in fact, greater than $1.00/mile. Land is consumed and non-renewable energy resources depleted, people are killed (60,000/year) and injured (2,000,000/year), the air is polluted (motor vehicles cause 50 percent of all air pollution-85 percent in the cities), crops are damaged, and people are caused to lose resistance to some types of illness (emphysema, aggravated by air pollution, is the fastest growing cause of death in our country).

A car uses 5 times as much fuel per passenger as a bus and 10 times as much as a train.

We expand our population of people by 2 million and our number of motor vehicles by 4 million yearly. Pollution control devices for these vehicles cannot be perfected to eliminate pollution, and auto engineers argue that another form of power for cars would not meet the expectations of the motoring public.

Public awareness and strong support will be needed to create new ways for people to move about. If a city, state, and the Secretary of Transportation all agree that a particular stretch of highway is not needed, they can then propose that the money be allotted to find mass transit. We need new laws.

We need to help future drivers be the instigators and planners for transportation systems that will minimize losses to environmental quality and to ourselves.

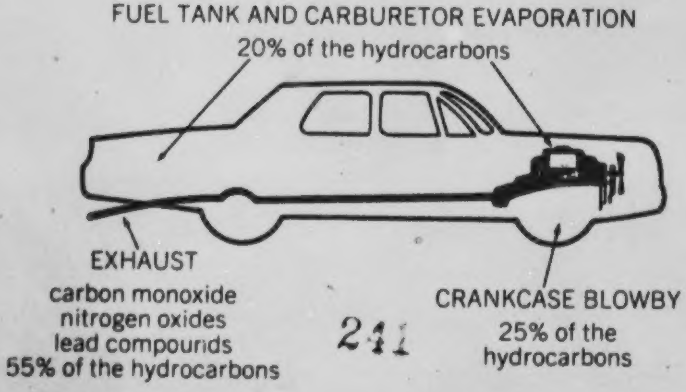
Before You Begin

Materials: maps of area (call town hall for maps) 1 for each child and 6 extras , colored pens, colored pins.

Words To Know

air pollution, mass transit system

SOURCES OF POLLUTANTS FROM AN AUTOMOBILE WITHOUT EMISSION CONTROLS



ACTIVITY

1. Discuss with the children the need for a transportation system that does not rely on or allow the present extensive use of cars. (Do the activity, "Why Drive that Car?", included in this volume.) Ask why they think:

   a. cars are hazardous

   b. people have so many cars

   c. people drive everywhere

   d. so few people use buses or trains

   e. each child is not driven to school by his/her parents.

2. The class project is to devise a transportation system that will replace the use of private cars in their area.

   a. Instruct them to learn where people go.

   b. Help them to organize that information they have acquired and

   c. Plan a new system.

3. Each child will be given a map of the local area, on which he/she will mark major driving routes used by his/her parents. (If the routes lead out of the map area, explain that they should find out what the destination is.)

4. Instruct children to transfer individual travel routes to a central map in the classroom. If possible, each child might have a different color or symbol code for his/her routes.

5. Divide the class into small groups of 4-5 children, each of which has a map.

6. The children will now lay out a mass transit system to replace all car traffic. They will determine routes for trains and buses being aware of the least and most heavily traveled routes. Taking into account less traveled, "out-of-the-way" places will require decisions about what kind of transportation to use to connect these places with major arteries. Use a different color or symbol code for each type of transportation.

Discussion:

Each group will present its mass transit plan.

They should be able to discuss: a.) why they think their plan is workable.
b.) the problems they haven't solved with their plan.
c.) why their plan is/is not superior to the present prevailing system of transport via car.

Related Activities

Obtain a map of the local bus routes and compare in class with the children's mass transit map.

Resources

"Environment and the Quality of Life: Energy-Society", Computer Based Resource Unit, New Jersey State Council for Environmental Education, EEC #834.

Miller, G. Tyler, Jr., Living in the Environment: Concepts, Problems and Alternatives, Wadsworth Publishing Company, Inc., 1975, EEC #B79

Sorvall, Vivian, Air Pollution: The World's Exhaust, Pendulum Press Inc., 1971, EEC #B23.

Wentworth, Daniel F., et al, Pollution: Examining Your Environment; Mine Publishing, Inc., 1971, EEC #B42.

The four basic food groups are fruits and vegetables, bread and cereals meat-fish-poultry (protein), and dairy products. It is important to eat a balance of these every day. "Junk" foods on the other hand offer little nutritional value and even foster poor health. As it is important to keep our bodies healthy with pure, basic foods it is also essential that air, water, earth, and heat be available in a pure form. When these elements are mistreated, pollution, waste of land (misuse of land), and destruction of the natural environment are the result.

In order to maintain a quality environment, human beings must forsake or alter desires that serve only to degrade the environment. Just as "junk" food must be avoided to insure our body's health.

Before You Begin

Materials: a quantity and a variety of magazines, construction paper for backing the bulletin board and lettering, a large empty bulletin board, four objects - one from each food group (a piece of fruit, an empty carton of milk, empty cereal box, picture of a fish or chicken), scissors.

Preparation: It is time-saving to prepare the bulletin board first with the title and the headings. The diagram below shows how this can be done:

INSIDE AND OUTSIDE			
WHAT WE NEED	WHAT WE DON'T NEED	WHAT WE NEED	WHAT WE DON'T NEED

Words To Know

protein, "junk" food, pollution, obesity

Inside & Out

Curriculum Topic

NUTRITION

Environmental Topic

ECONOMICS, TECHNOLOGY & CULTURE

Skills

Reading, brainstorming, classifying

Subject

Science

Grade Level(s)

5

Site

Classroom

Author

Betsy Giovine

Objective

The student will be able to:

1. identify essential and non-essential needs for the "inside" and "outside" of the human body
2. classify magazine pictures under the following categories:
   - a. "inside" needs
   - b. "outside" needs
3. recognize the difference between what one needs to survive and what interferes with survival.

To The Teacher

The four basic food groups and the four essential elements to survival (air, water, earth (soil), heat (energy)) are compared in this activity. These necessities of life are most effectively utilized if they are in their purest form. In this activity the students will recognize that physiological needs and nutritional needs are often in conflict with other desires or wants.

ACTIVITY

Part I - Motivational Discussion

1. Put 4 objects (one from each food group) before the class and discuss their importance to good health.

2. Hold up each object one at a time and ask the class to put the objects in the proper food group.

3. Explain that in order for our bodies to grow properly, we must choose a balanced diet from these food groups.

4. Brainstorm with the class a list of "junk" foods. (They should all know this term, but if not, start off with the all time favorite, Twinkies).

5. Consider the pros and cons of eating "junk" food. (Example: weight gain leads to health problems, sugar destroys teeth, contributes to nervous disorders, etc.)

6. Explain to them that just as waste pollutes our environment, junk food pollutes our bodies.

7. Then contrast the good food necessary to keep the inside of their bodies in good shape, with the essentials "outside" the body that are also necessary to one's survival. These are heat (energy), water, earth (soil), and air.

8. Consider with the class what would happen if these essentials are abused (environmental destruction through fires, water and air pollution, depletion of nutrients in soil, energy waste).

9. Ask how this abuse can affect humankind. (general discussion)

Part II - Construction of Bulletin Board

1. Divide the class into 4 groups.

2. Assign the following categories to each group:

   Group 1 - foods we need for the insides of our bodies.

   Group 2 - foods we don't need for the insides of our bodies.

   Group 3 - elements we need for the outsides of our bodies.

   Group 4 - elements we do not need for the outsides of our bodies.

3. Explain that each group is responsible for cutting out magazine pictures corresponding to their group assignment. They are also responsible for arranging the pictures attractively on their section of the bulletin board.

4. Circulate to give help. This process will probably take more than one class period. (You might want to give the motivational discussion in one period and construct the bulletin board in another.)

5. Give assistance in arranging the pictures on the bulletin board.

Related Activities

1. Research how these essentials to survival - earth, water, fire, and air were derived.

2. Plan a balanced diet for the body inside and outside (nutritionally and environmentally).

Notes To Myself

"And cut out the starches."

ENVIRONMENTAL QUALITY

ENVIRONMENTAL QUALITY

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ENVIRONMENTAL QUALITY

Most animals are at their functional peak when environmental conditions are kept within certain narrow limits. For example, if the water around a fish is either too hot or too cold, the fish will die. But it has been found that if a fish is raised in water that is slightly warmer than its usual optimum, it can tolerate slightly higher temperatures than other members of its species. This ability to adapt to conditions other than those the organism has adapted to is called acclimatization. We humans do it too. When one enters a busy secretarial office, one is immediately affronted by the clatter of many electric typewriters. But after an hour or so working in such an office, one becomes so used to the noise that it is disturbing if all typewriters are turned off. Of course, there are limits to our adaptability--if the atmosphere were to rapidly become dominated by carbon dioxide and sulfur dioxide instead of nitrogen and oxygen, we would all be dead, and natural selection would not operate quickly enough to evolve new lungs to respond. But since we can tolerate a very broad range of environmental conditions and still not only function but apparently thrive, the meaning of "environmental quality" is not always very clear.

Certainly, environmental quality does not mean a complete return to the pristine, pre-human environment. The air and water might be cleaner but it would be awfully unpleasant to dress in loincloths, live in caves and compete with the tigers for food. Many economists don't even think that reducing environmental pollution to zero would mean achieving the greatest possible environmental quality. They feel that the costs involved in reaching such an idealistic goal outweigh the benefits. And most of us are probably not consciously aware of the most blatant environmental deterioration in our everyday lives. We accept the noise of jackhammers, the slight stinging of the eyes, the dull grey tint on our buildings as normal concomittants of urban existence. But we do know, at least in the abstract, that there is another way--albeit remote--to exist; a way in which humanity modifies nature to a minimal extent and the ecosystem is essentially undamaged by human activity. In a world in which all environmental decisions involve tradeoffs, this appears to be the ultimate one: we can achieve perfect environmental purity, but only if we are willing to sacrifice art, electricity, the division of labor, and everything we commonly think of as "human". Obviously the happy medium lies somewhere between the world of the Bushmen and the world of Tokyo, London, and New York.

There are two views of environmental quality. One views the ultimate in quality as that which nature granted us, and any intervention by man is disruption of the natural balance and environmental deterioration. The other views the environment as existing simply to provide human needs, and any modification which makes life easier for people means an increase in environmental quality. It would seem impossible to reconcile these dichotomous views--one sees humankind starting at infinite environmental quality and subtracting from it toward zero, while the other sees the start at zero environmental quality which man adds to steadily, with an infinite potential for improvement.

Yet reconcile these views we must. On the one hand we must respect all living things and know that we can never build a completely synthetic environment that will replace the natural one . We are, even in our cities, dependent upon natural gifts--the chlorophyll in green plants, the oxygen in the air, the fossilized creatures that form our petroleum, coal, and natural gas. At the same time we must recognize that people's needs and desires have gone beyond simple survival, and that the human-made environment is an important expression of human creativity. It is thus our responsibility to remember that a quality environment means the possibility for each individual to achieve his or her fullest human potential.

Preserving environmental quality means preserving wilderness, protecting endangered species and not polluting lakes. It also means harvesting trees, keeping pests from our food, and restocking lakes so they can be fished. It further means feeding the world's poor, educating the illiterate, and keeping the cities as quiet, clean and healthful as possible. The goal is no longer simply the greatest good for the greatest humber. We must achieve the greatest good for the greatest number with the proper respect for the natural systems on which we all depend, and with the proper respect for the thought, creativity and independence that makes Homo sapiens a unique species.

-Steve Gold

Indian Perceptions

Curriculum Topic

INDIANS

Environmental Topic

ENVIRONMENTAL QUALITY

Skills

Writing, reading, brainstorming, evaluating information

Subject

Social Studies

Grade Level(s)

3-5

Site

Classroom

Author

Betsy Giovine

Objective

The student will be able to:

1. compare and contrast the environment prior to European settlement in the New World to the environment as it is today,

2. relate his/her feelings about the present-day environment through the eyes of an Indian of today.

To The Teacher

It is always essential to stress the fact that the Indians were in the New World years before the Vikings or Columbus arrived. Their culture was controlled by and in harmony with the natural environment.

During a lesson on the Indian way of life, comparing and contrasting the New World before and after the Europeans settled it is a good way to expose students to the consequences (both positive and negative) of a technological society. It must be remembered that increasing human populations, rising levels of living and the resulting demands for greater industrial and agricultural productivity promote increasing environmental contamination.

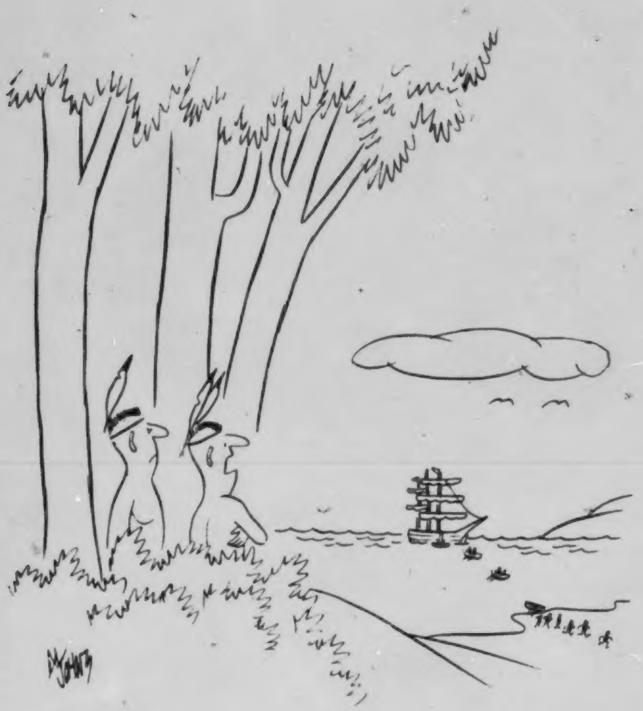
Before You Begin

Materials: an overhead projector, essay paper, pencils

Preparation: Make an overhead transparency of the attached cartoon. This will be the focus of the writing activity.

Words To Know

Any terms appropriate to teaching an Indian unit.



"AW, LET'EM STAY... WHAT POSSIBLE HARM CAN THEY DO?"

Conservation News 11-1-76

ACTIVITY

Part I - Motivational Discussion

1. Through discussion review the fact that the Indians had settled in the New World long before Europeans sailed for it.

2. Ask the class to imagine what it must have been like in the New World before the Europeans arrived. Ask them to describe what they have imagined. Brainstorm a list of improvements to and destruction of the North American continent.

Part II - Essay writing

1. Show the cartoon using the overhead projector. (On preceding page.)

2. Have a student read the caption and describe what is going on in the cartoon.

3. Tell the class they will be writing an essay focusing on the cartoon and the class discussion.

4. Read the following assignment to the class:

   Pretend you are a descendant of one of the Indians who watched the Europeans arrive. Write an essay in the "I" form expressing how you feel about the state of the environment today.

   Think - are you pleased?
   - are you angry?
   - what would you like the environment to be like?

5. Share the essays when the assignment is completed.

6. Try to bring into class statements by contemporary Indian people for children to compare with their essays.

Related Activities

1. Visit an Indian exhibit at a nearby museum.

2. Make dioramas depicting the environment before the settlement of the New World as compared to today's environment.

Credit

Cartoon taken from "EEC Newsletter," 1977 (New Haven), Vol. 1, No. 5 p.3

Notes To Myself

Making and Using a Map

Curriculum Topic
GEOGRAPHY - maps

Environmental Topic
ENVIRONMENTAL QUALITY

Skills
Mapping data, measuring, Interpreting maps

Subject
Social Studies

Grade Level(s)
3 - 5

Site
Schoolyard, park, shopping center, residential area

Author
Sandy Price

Objective
The students will be able to:

1. make a map of an area
2. use the points plotted on the original map to locate points in another area
3. compare characteristics of two different environments.

To The Teacher
This activity will give children the opportunity to have a different experience using maps. Rather than merely looking at a symbol (map) to visualize what it represents, they will start with the concrete (land and objects around them) to create the map. In addition, the students will be comparing aspects of two different environments, one natural, one built by people. The idea is to motivate them to consider what is lost and what is gained in the two different settings. The first map should be made in an at least partially natural setting. The students will describe on their maps what they find in various locations within the area: plants, types of soil, animals, etc.

Using the same map, but proceeding to an area that has been changed from its natural appearance by buildings, students will find points corresponding to those which indicate findings in the natural setting. The map will now aid them in describing and comparing what they find in the second area with what they uncovered in the first.

To make more copies of a map, the original can be laid over a stack of papers and holes punched through the papers with pins where each point is marked on the original map.

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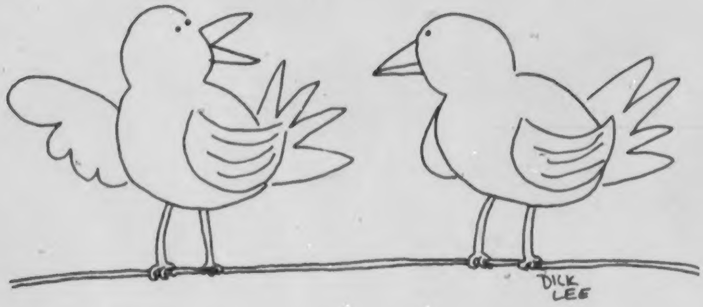
Before You Begin

Materials: plain or graph paper, board on which to tack paper, stool on which to set board, compass, yard stick or other straight stick, thumbtacks, pencils, tape measure (optional), stakes to set in ground (one for each student), and paper for recording observations

Words To Know

map, boundaries, orient, compass



"... about seven miles as the man walks."

Conservation News

ACTIVITY

I. Mapping an Area

1. Locate boundaries for the area to be mapped.

2. Determine scale for distances on map, example: 1 ft. = 1 inch or 1m = 1cm.

3. In the center of the area, set board with paper attached to it by thumbtacks on a stool. Put a stake in the ground next to the stool.

4. Orient the edge of the paper with the north-south line on the dial of a compass. Label N-S on the paper.

5. Place a dot near the center of the paper to mark where the mapping board is on the map itself. Have the children explore the area and place their stakes at places where they want to describe what they find.

6. Position the end of the sighting stick at the center dot on the paper and sight along the stick toward a stake. Draw a line from the center dot along the stick in the direction of the stake to the edge of the paper.

7. Measure the length of a child's normal stride.

8. Having done so, ask students to step off the distance from the mapping board to the stake. Record distance.

9. From the center dot, mark the position along the sighting line that is to scale for the stake's distance from the center of the area. (For example, if the scale is 1m = 1cm and the stake is 3 meters away, then the position on the map is 3cm away from the center dot on the line of sight.)

10. Follow these steps for placing the location of the other stakes on the map.

II. Describing the Area

The students will take paper and pencil to write down what each finds in the area around his/her stake. (Perhaps the area would be the circle they walk at arm's length from the stake.)

III. Using Map to locate points in a "developed" setting

1. Set up map, board and stool in the center of the area. Using a compass, orient the map.

2. Each student will go to a place in the area which corresponds to a location on the map.

a) One student will position the end of the sighting stick at the center dot on the paper and along a point on the map. This student will sight along the stick to tell another child setting up a location which way to go.

b) The student going to a location will walk in the direction indicated according to the number of paces corresponding to the map's scale.

3. If it is possible, set a stake at the location. If not, estimate the boundaries of the area.

IV. Describing the Area

The students will again write down what they find in their areas.

V. Discussion:

1. Ask students to name quickly the things they found in their natural settings. (A list might be put on the board.)

2. Ask them to compile the same list for the built-up setting.

3. Compare the two locations:

   a) Purpose served by each

   b) What happens in them? Who uses or could use them?

   c) Kind of energy each requires (sun vs. nonrenewable resources)

   d) Evidence of damage to the environment (erosion, pollution)

   e) How the students themselves reacted to noises, colors, objects, safety, etc. found within each area.

Related Activities

1. By leaving the stakes in the ground as a point of reference, children can be given practice reading the map by being assigned to a designated location on the map.

2. Students can watch for changes in the areas they described (e.g., changes after a rain or drought, from one season to another, etc.).

Resources

Dole, Rober,"Simple Mapping, Radial Method," Beyond Your Classroom: An Outdoor Activity Guide, Outdoor Education Center, New Milford, Ct., pp. 52-53, EEC #786

Notes To Myself

Our Drinking Water

Curriculum Topic

GEOGRAPHY

Environmental Topic

ENVIRONMENTAL QUALITY

Skills

Experimenting, observing, using information for a purpose, evaluating information

Subject

Social Studies

Grade Level(s)

3

Site

Classroom

Author

Arthur C. Braun, Jr.
Antoinette R. Giovannitti

Objective

The student will be able to:

1. describe how industries are contributing to decreased water quality,
2. distinguish between visual and nonvisual water pollution.

To The Teacher

The effects of industrial wastes on aquatic systems are vast. An example of the result of the pollution of our waterways is the 400-500 major fish kills reported yearly. Some of the conditions leading to these kills are as follows: 1) chemicals used to flush the lines of power plants (sodium nitrite, hydrazine, ammonium bifluoride, and soda ash); 2) bags of endrin used for insect control accidentally dumped into streams; 3) the unauthorized applications of copper sulfate used to control plankton blooms; 4) outfall from paper mills containing lignite and sulfite waste liquor; 5) acid mine drainage into streams; 6) concentrated sulfuric acid released from cotton seed delinting plants; 7) seepage of the pesticides cholorane and heptachlor from termite treatment projects; 8) leakage of chromium solution from a plating tank into sewer systems; 9) cyanide released from drains of blast furnaces at steel companies; 10) hot water from a steam generating plant released into streams. These are merely examples of the toxic effects which industrial and agricultural operations may have on water quality.

Chlorine added to water to control bacteria and algae may persist in streams to cause mortality of plankton and fish. Mercury as a by-product of industrial operations, power plants, laboratories and even hospitals, has been recorded to the extent of 23 million pounds per year throughout the world. In Japan, human illness and death occured in the 1950's among fishermen who ingested fish, crabs and shellfish contaminated with a simple alkyl mercury compound from Japanese coastal industries.

A basic concern is the finite nature of quality surface and ground water supplies. Water use for domestic and industrial purposes is increasing dramatically.

In this activity the student will discover that pollutants are both visible and nonvisible and are destroying water quality.

Before You Begin

Materials: Have available: water and sand, leaves, pebbles, cigarette butts, oil, milk, etc. (students may bring these in). Also have available several clear containers and stirring rods, salt, sugar, chlorine, other chemicals.

Words To Know

industrial, chemical, visual, invisible, detrimental, pollutants, toxic, usable, unusable, pesticides, wastes

"And to drink, sir, may I suggest Aqua Pura 1970, a very good year."

ACTIVITY

Ask the following questions:

1. How are we dependent upon water?
2. Why are large cities often located near waterways? (Waterway systems are easily accessible routes of transportation. Factories need an abundance of available water to function. They rid themselves of waste by dumping into the nearby waters and they use the water as a coolant.)
3. In what ways are industries harming our environment? (See Teacher Background)
4. How can we determine that water is polluted?
5. Conduct a visual demonstration. (Students may work independently or as a class.)
    a. Add to a jar of water many visible pollutants that students bring to the class (sand, leaves, pebbles, cigarette butts, oil, milk, etc.) Discuss and list observations. Of these items, which is the most detrimental to water quality?
    b. Add to a second jar of water invisible pollutants such as sugar, salt, chlorine, or other chemicals. Discuss and list observations. Point out in the discussion that the clarity of the water does not determine its quality. Water that appears to be clear can be just as detrimental to ones health as water that is visually impleasant.

Related Activities

1. Write one of the following stories:
    a. What would happen in our city if all the water became unusable?
    b. What would happen in a forest if all the water became unusable?

2. Collect pictures from magazines, newspapers, and old texts to make a huge scrapbook showing all things that benefit from clean water.

Credit

Stapp and Cox, "Our Drinking Water," Vol. III Mid. Elem. Activities p. 56-60

Southwick, Charles H., Ecology and the Quality of Our Environment, Van Nostrand Reinhold Company, 1972, EEC B56.

Drawing: Cecelia Zych

Water for Fun

Curriculum Topic

CONNECTICUT
CURRENT EVENTS
MAPS

Environmental Topic

ENVIRONMENTAL QUALITY

Skills

Map reading, interpreting maps

Subject

Social Studies

Grade Level(s)

3-5

Site

Classroom

Author

Antoinette R. Giovannitti
Arthur C. Braun, Jr.

Objective

The student will be able to:

1. explain how reduced water quality affects many recreational activities.

To The Teacher

In Connecticut there are many outdoor recreational activities dependent upon water - swimming, fishing, boating, surfing and water skiing. The proximity of attractive bodies of water enhances the recreational potential of land for camping, hiking and nature trails. Recent changes in life styles, work habits and income since 1970, have resulted in even larger numbers of Connecticut residents using recreational facilities.

The quality of the water, including the amount of pollution, appearance, odor and rate of flow are among factors that determine whether or not it is usable for recreation.

In Connecticut many bodies of water are in danger of becoming unusable for recreation because of the deteriorating quality of the water and its adjacent land.

In and around Bridgeport, New Haven, Hartford and New London, there are large concentrations of people and industry requiring such services as waste treatment and electricity. Urgan development, industry and utility concentrations often contribute to what eventually becomes water pollution.

The bacteria which normally live in water increase in number in response to the organic material in untreated sewage. They act to decompose the sewage and, in the process, utilize much of the dissolved oxygen in the water. The condition of high organic content and low oxygen content is known as eutrophication. The bacterial population also increases due to the tremendous amounts of bacteria contained in human wastes. Thus, the bacteria in water have two detrimental effects: 1) they consume a great deal of oxygen during eutrophication so that other organisms are deprived of the oxygen they need to exist and 2) they cause a dangerous health hazard to both humans and wildlife as a result of a high coliform bacterial count.

Industries and electric power plants often require water as a coolant. If it is taken from nearby lakes, rivers, and estuaries it is warmed and returned. Many of the organisms cannot tolerate these temperature increases and die.

Oil is being used today in tremendous quantities. Much oil is also being transported in ships which pass through waterways near recreational areas. In the process of ship loading, transport, and unloading large amounts of oil are spilled. This spilled oil, can adversely affect the wildlife and recreational potential of an area.

Water pollution is not limited to highly populated areas. Many rural farm areas, use chemicals, fertilizers, insecticides, and herbicides which, through rain runoff, are carried to streams, lakes, estuaries, and coastal waters. Human and livestock wastes are often not treated and also run off into surrounding water bodies. These wastes can be toxic to organisms and upset the ecological balance. Fertilizers promote aquatic plant growth in large numbers and after they die, eutrophication occurs.

Erosion of soil is a ntural process, but its rate is increased by human activities such as deforestation and improper farming techniques. The silt formed from erosion can fill up and reduce the lifespan of a body of water and cover the food supply and nesting areas of fish and shellfish.

Increasing population is causing rapid development of recreational areas, which is resulting in a sharp increase in pollution. Often land development occurs so rapidly that there is little thought given to imporved waste treatment facilities or the ecological effects of homesite building.

What can be done to conserve our water resources? People should become aware of the pollution problem for a twofold purpose: 1) people would be more conscious of their effect on the environment and 2) they would be able to work with public officials to improve municipal pollution control facilities and to plan for future population growth and the resultant increase in pollution. It must be realized, however, that many industries, farms and utilities which contribute to water pollution are of great economic importance to the country. Thus a compromise must be reached which allows for maximum protection of the environment compatible with economic and industrial growth.

Connecticut has a suitable climate and an excellent resource base for outdoor recreation - over 250 miles of coastal shoreline, many inland water bodies, large areas of relatively undeveloped land and a varied landscape of forest, farmland, rolling uplands and scenic river valleys. But the evidence of population increase and changing development patterns is visible throughout the urban corridor - in gorwing suburbs, in commercial and industrial expansion and in the highway networks which serve them. The consequences for open space are equally evident - vanishing tidal marshes, threatened ridgetops and scenic river valleys and the growing pressures on limited recreation facilities in and near urban centers. The 253 miles of irregular shoreline which form Connecticuts' southern boundary on the Long Island Sound are a major water resource for recreation. Approximately two thirds of this shoreline has recreation potential - in beach, bluff and marshland. Public access to salt water is, however, limited. Only about nine miles are in publicly-owned beaches. Coastal wetlands, which are important in flood control, waterfowl refuge, and for the production of fish and shellfish nutrients are being lost at a rapidly increasing rate. Almost 13% of the coastal wetlands which existed in 1954 had been lost by 1964.

Although there are nearly 6,000 inland water bodies in Connecticut, about 5,000 of these are less than one-half acres in size. The largest are man-made; Candlewood Lake (5,420 acres) and Barkhamstead Reservoir (2,320 acres). Over 190 are water supply reservoirs, which make up about 30% of the total lake acreage and with few exceptions are not available for recreation. Total water area is about 150 square miles; 61% in inland water bodies and the remainder in rivers and streams.

Three major interstate river basins drain most of the state, the Housatonic on the west, the Connecticut and the Thames on the east. Several smaller coastal rivers drain shore areas, the largest of which is the Quinnipiac. The Connecticut River is the most important and is navigable to Hartford.

Wetlands are found in all areas of the state, but are concentrated more in the eastern and western sections and near the headwaters of the larger streams.

Although Connecticut is relatively well endowed with water, the areas available for recreation use are limited. Pollution of water, lack of public access, conflicting water uses, areas not adaptable for recreation purposes, size and location, are all limiting factors.

The State of Connecticut has the basic responsibility for the comprehensive statewide planning of recreational facilities, but it does not usurp the fundamental responsibilities or perogatives of local government. Planning for recreation of a local nature is the job of the towns and cities, individually or in cooperation, and the state confines its part tothe process of stimulating and guiding local effort.

Before You Begin

Materials: Connecticut State Maps (may be obtained from Connecticut Department of Transportation, oil companies, Connecticut Motor Club (AAA), Rand McNally Co., or student may bring one from home.) Water recreation pictures (Ranger Rick Magazines and other nature and conservation magazines a are excellent sources). Pictures of polluted waters (can be found in National Geographic, June, 1971 p. 866 and December 1970, p. 738 or Time and Newsweek).

Caution: Seasonal activity

Words To Know

recreational facilities, chemicals, bacteria, factors, odor, quality, deteriorate, waste, utilities, organism, accommodate, potential, awareness, aesthetic.

Conservation News

Credit

"Water for Fun", Marine Environment Curriculum Study Marine Advisory Service, University of Delaware and Population-Environment Curriculum Study, College of Education University of Delaware, Fall, 1974.

"Connecticut Comprehensive Statewide Outdoor Recreation Plan 1965-1970" State of Connecticut, John Dempsey, Governor.

ACTIVITY

1. Present students with maps of Connecticut or ask them to bring one from home.

2. Ask students to locate the Connecticut River, Housatonic River, Thames River, Quinnipiac River, Lake Quassapaug, Candlewood Lake, Lake Campounce, Barkhamstead Reservoir and Long Island Sound on their maps.

3. Ask them to locate a recreational area that they may know of on the map. (One student and the teacher can lead the activity with a map that all can see and compare it with their indivudual maps.)

4. Have pupils locate bodies of water they have visited and tell what they did there. The discussions should bring out the fact that most bodies of water are visited for recreational purposes - fishing, swimming, boating, water skiing, etc.

5. Show pictures of water recreation.

6. Ask the students to describe how the water looks in these pictures.

7. Ask the students what things pollute the water or make the water dirty and unusable. It is important that students understand as many of the causes described in the teacher background as their level of comprehension permits. In this way, the student will become aware of the detrimental effect of pollution on their environment.

8. Show pictures of polluted waterways and compare these to the pictures from step #5.

9. Ask the students whether they have ever gone to a beach only to find that swimming was not allowed. Why do they suppose this could happen? (Answers may include health, and aesthetic reasons: the water is not pretty; it smells; it has garbage or chemicals in it; it has oil in it; the bacterial count is high.)

10. What part do people play in pollution.

11. Can you foresee the possibility of public swimming areas being limited to a set number of people per day? Why?

12. What can we do to limit the pollution of the marine environment?

Related Activities

Draw a large outline of your state on 4' x 6' paper. Have groups of students place symbols for recreation on the water areas. They may draw their own pictures of boats, swimmers, fishermen, fish, clams, oysters, etc.

Resources

"Connecticut Comprehensive Statewide Outdoor Recreation Plan 1965-1970" State of Connecticut, John Dempsey Governor

National Geographic, June 1971, p. 866.

National Geographic, December 1970, p. 738.

Look at the Air

Curriculum Topic
URBAN STUDIES

Environmental Topic
ENVIRONMENTAL QUALITY

Skills
Observing, collecting and compiling data
Measuring
Predicting

Subject
Social Studies

Grade Level(s)
3 - 5

Site
schoolyard, classroom, neighborhood

Author
Sandy Price

Objective

Students will:

1. become familiar with sources of air pollution
2. recognize the problems associated with curbing air pollution
3. become familiar with local ordinances for monitoring air pollution
4. collect and observe air pollutants and discuss possible sources of these particles.

To The Teacher

Air pollution is a major environmental problem that we must bring under control. Students are exposed to the air pollution problem throughout their lives.

"Clean air is a colorless, odorless mixture of gases. The components of clean air are: 78% nitrogen, 21% oxygen, and 1% of a variety of other gases, including carbon dioxide and water vapor." (Sorvall, p. 17) This mixture of gases, which is necessary to sustain life, lies in a thin layer (10 miles deep) close to the earth's surface.

Humankind is constantly sending foreign substances into the air, thus causing air pollution. These foreign particles can be divided into 3 categories:

1) solids: dust, soil, soot, ash. These substances find their way into the atmosphere via wind, erosion and incineration of garbage. Because they are solids, the particles eventually drop out of the air.

2) gases: oxides of sulfur, nitrogen, carbon. Their sources are coal and oil burning furnaces, refineries, and gasoline engines. These gases usually stay in the air and build up over time. (Wentworth et al.)

3) aerosols: solid or liquid particles mixed with gases. These particles come from insect and deoderant spray and from many industrial processes.

Before You Begin

Materials:

wax paper, rulers, pencils, tape, 3 x 5 cards or cardboard squares or blocks of wood, vaseline, magnifying glasses and/or microscope

Time: Allow 1 period to prepare and locate collectors, 1-week waiting period to collect pollutants, and one to two periods to observe and discuss findings.

Words To Know

air pollution, solid particles, aerosols, gases

RESUME BREATH- ING

Illustration: Audubon Magazine, May, 1976

ACTIVITY

1. Brainstorm with students the characteristics of clean air (colorless, odorless, and non-irritating.) Ask them to list evidence of pollution in the air, i.e., dust on furniture, haze over the city sky, odors from factories, eyes stinging. Tell them about the three different kinds of pollutants to help them think of more examples.

2. Explain that you are going to collect and examine pollutants in the air. They will be collecting only the solid particles. (Gases require sophisticated equipment to collect and measure.)

3. Make pollution collectors:

   a) tape waxed paper to 3 x 5 cards, cardboard, or wood blocks

   b) mark off 1/2" squares on the waxed paper

   c) number the cards

   d) smear the paper evenly with vaseline

4. Set the collectors in selected locations, such as the classroom, the edge of the parking lot, the cafeteria, a corner of the playground, or the hood of a car. Some students may take collectors home and place them in different rooms of the house, or in the yard. To make other comparisons, cards might be placed on a car driven only outside a city vs. one driven in the city. Or, place a collector in a grassy area in the country and place another in a grassy area in a city park. Place collectors in downtown and factory sites. In a log, note the number of each card and where it was placed.

5. Leave the collectors undisturbed for a week or longer.

6. Then examine the collected particles with a magnifying glass or microscope.

   a) Look in one of the 1/2" squares.

   b) Count the number of different types of materials in that square. Record and describe this information in the log.

   c) Count the number of each type in that square. Record in the log.

7. Determine what the particles might be (some will not be recognizable) e.g.,

   a) pieces of animal hair

   b) small jagged shapes that reflect light - may be pieces of mica found in sand

   c) burned embers - black, sooty, with sharp, jutting corners

   d) pieces of leaf (cells evident)

8. If possible, derive a graph(s) from the data collected to show the variation in the different locations.

9. Discussion:

   a) What was the most common type of materials collected?

   b) Where was it found?

   c) Where do you think these pollutants came from?

   d) Do you think some of the pollutants travelled a long distance? How did they get there?

   e) Which pollutants are most harmful to people? Why?

10. Compare areas where pollution was collected. Was the air in some places more polluted than others? How do you account for this?

11. Make a list of city conveniences which are beneficial to people but at the same time pollute the air.

12. Should we cut down on pollution by shutting down factories and power plants? Why or why not?

13. Discuss alternative ways of reducing air pollution, i.e., more grass and trees to keep soil in place, fewer cars and more public transportation.

Related Activities

1. Take a walk through various areas of a city and look for sources of air pollution.

2. Listen to daily air quality reports on the radio. Set out pollution collectors on days when the air quality is high or low. Compare your findings.

Credit

Environmental Repair Kit, Talcott Mountain Science Center, Avon, CT EEC #33

Sorvall, Vivan, Air Pollution: The World's Exhaust, Pendulum Press, Inc., W. Haven, CT, 1971 EEC #B23

Wentworth, Daniel F., et al., Pollution: Examining Your Environment, Mine Publ., Inc., Minneapolis, MN, 1971 EEC #B42

Notes To Myself

270

Where Would You Like to Live?

Curriculum Topic

URBAN STUDIES: urban land use,
city planning

Subject

Social Studies

Environmental Topic

ENVIRONMENTAL QUALITY:
City planning will improve the aesthetic qualities of the environment.

Grade Level(s)

3 - 5

Site

Classroom

Skills

Constructing models
Identifying feelings about alternatives

Author

Paul Sanderson

Objective

The students will be able to:

1. plan a city to meet their needs and reflect their values,
2. describe how community planning affects the quality of life,
3. examine their feelings on how communities are organized.

To The Teacher

The history of community organization in this country is in many instances a history of community disorganization. The initial response to unplanned growth was zoning - the designation of particular areas for specific human uses. With the advent of comprehensive community planning, zoning has become a principal method in land development.

Ideally, community planning and zoning occurs before community development. Zoning is only a preventive - it cannot force removal of undesirable uses by post facto legislation. Therefore, a community at the earliest possible date must 1) define community values and goals, 2) develop a long-term plan consistent with these values and goals, and 3) implement zoning ordinances to prevent incompatible uses.

A primary purpose of zoning is to protect adjacent plots of land from incompatible usage. The community is typically split into zones for commerce, industry and residence. Environmentally conscious communities are preserving open space by establishing density regulations and by zoning recreational and floodplain areas. A balance must be struck between form and function.

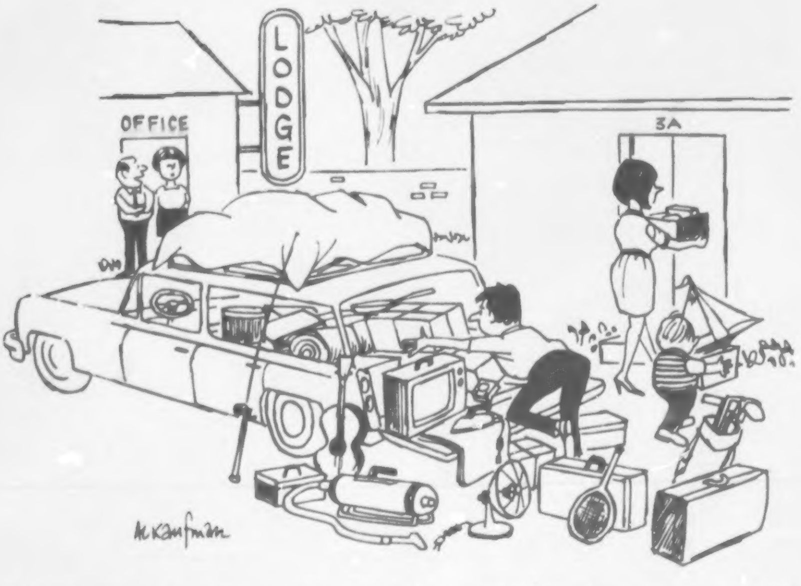
Some community facilities such as dumping areas, factories and highways are functional necessities, but they receive little in the way of aesthetic consideration. On the other hand, greater consideration for aesthetic value is often given to the planning of parks, theatres, libraries, churches, museums and residential areas. Planning notwithstanding, a community may boast of a beautiful highway and a monstrous schoolbuilding. By clarifying and codifying its values, a community can reach the happy medium in constructs which are practical, functional and aesthetically pleasing. This activity is designed to help students become aware of their own values, and to implement them in community planning and zoning.

Before You Begin

MATERIALS: activity sheets, pencils, erasers

Words To Know

community, key, design, plan, organize



"THEY HAVEN'T GOTTEN AWAY FROM IT ALL. THEY BROUGHT IT WITH THEM!"

Conservation News 4-15-75

ACTIVITY

1. Explain to the class that each student will design a community in which they would like to live.

2. Pass out the rank ordering sheet (Student Sheet #1) and instruct the students to rate each building in order of appeal (1 for the one they would most like to live near and 7 for the one they would least like to live near).

3. Students will do both ranking exercises.

4. Survey the class as to which buildings were ranked # 1. On a master list, record the building and its total votes. For example, a park might receive five 1's, a restaurant two 1's, etc.

5. Have the class determine the reasons for ranking a particular building # 1.

6. Survey, record and discuss the remainder of the rankings.

7. Pass out the community planning sheet (Student Sheet #2).

8. Encourage the students to plan their communities according to their own needs and desires.

9. Explain the key symbols and have the students use them on their sheets.

10. The task if for each student to design a community reflecting his/her values.

11. After completing the designs, students will pick three buildings which they placed close to "home". They will then explain their choices.

12. Each student will then pick three buildings that were not used or that were placed a far distance from their "homes". Explain why.

13. Discuss why some buildings are preferred near residences (parks, playgrounds, schools).

14. Discuss why some buildings and places are disliked near residences, (factories, highways, fire stations).

Related Activities

1. Design a large version of the map, with bigger symbols. The students can then physically move on the map, discussing various kinds of community plans.

2. Make a map of your school's community. Discuss aspects of the layout which students like or dislike.

3. Following a discussion of community planning, have students redesign their original plans. Then discuss the reasons for any changes.

Resources

"A Place to Live," National Audubon Society, 1970, EEC #58.1

"Megalopolis," Montgomery County Public Schools, Rockville, Maryland, EEC #1215.2

273

Credit

Material for the Activity was taken from:

Coon, Herbert L., M.L. Bowman, "Environmental Education in the Urban Setting: Rationale and Teaching Activities," ERIC, Columbus, Ohio, pp. 101-102, EEC #1282.2

Material for "To the Teacher" was taken from:

Solberg, Erling D., "Planning and Zoning for Better Resource Use," Soil Conservation Society of America, Iowa, 1971, EEC #PT 19

Steve Gold, contributor

Notes To Myself

STUDENT PAGE

WHICH WOULD YOU RATHER LIVE NEAR?

______________ A PARK

______________ A HOUSE

______________ A FACTORY

______________ A GROCERY STORE

______________ A SCHOOL

______________ A RESTAURANT

______________ A POLICE STATION

WHICH WOULD YOU RATHER LIVE NEAR?

______________ A CANDY STORE

______________ A FIRE STATION

______________ AN APARTMENT HOUSE

______________ A PLAYGROUND

______________ A MOVIE

______________ A SUPERMARKET

______________ A CHURCH

STUDENT PAGE

DIRECTIONS: USE THE KEY BELOW TO PLAN A COMMUNITY. DRAW THE SYMBOLS IN THE AREAS WHERE YOU FEEL THEY WOULD BE MOST APPROPRIATE.

▨	YOUR HOUSE
SM	SUPERMARKET
G	GROCERY STORE
C	CANDY STORE
R	RESTAURANT
M	MOVIE THEATRE
◍	FACTORY
⊞	APARTMENT HOUSE
S	SCHOOL
F	FIRE STATION
P	POLICE STATION
C	CHURCH
🌳	PARK
□	HOUSE
Π	PLAYGROUND

Listen to This

Curriculum Topic
SELF AWARENESS

Environmental Topic
ENVIRONMENTAL QUALITY

Skills
Computing, listening, concentrating-

Subject
Math, Social Studies

Grade Level(s)
3-4

Site
Classroom

Author
Vicki Parker

Objective

After completing this activity students will be able to:

1. recognize noise pollution.
2. list two detrimental effects of noise pollution.

To The Teacher

Noise has been cited as a threat to physical and mental health and a common annoyance. The effects of noise pollution touch on medical, psychological and social problems.[1] At a more basic level, noise interferes with an individual's ability to concentrate on a chosen task. "Noise causes difficulty when we are trying to think because it brings extraneous information into our thought processes. That information gets in the way of the information we are trying to think about."[2]

Through this addition exercise, students will discover how extraneous noise effects their ability to concentrate. The activity should occur on two days at the same hour. Day I will act as the "control" in the exercise and Day II will demonstrate the results of a single variable on the exercise.

Before You Begin

Materials: Duplicated copies of math worksheets A and B (enough for each individual).

Student's story (appropriate for grade level) such as "Little Sambo" or any story containing many numbers.

ACTIVITY

Day I

1. Under quiz conditions, have students complete math worksheet A in a designated time limit.

2. Collect worksheets from students and corret. However, do not return corrected worksheet to students.

Day II

1. Distribute math worksheet B to students for completion. Explain to the class that due to time limitations, story hour will be combined with the math exercise.

2. While students work quietly on their math problems, read the story to them dramatically! Be sure to emphasize numbers and try to maintain students' interest.

3. When students have completed math worksheets, collect papers, correct and return both worksheets (A and B) to students.

Debriefing

1. Do individual's scores vary between the two papers?

2. Was one set of problems more difficult? (No, all problems are exactly alike.)

3. Why do you think Worksheet B was more difficult? (Because of the distraction of the story.) How did you feel while completing exercise B?

4. Is there a name for this type of distraction? (noise pollution)

5. Can you name other types of noise pollution? (jets, automobile horns, vacuum cleaners, loud music, jack hammers, pencil tapping)

6. Is noise pollution harmful? How? (Hard to concentrate, damages hearing, leads to medical problems, cause irritability)

7. How can you help stop noise pollution? (quieter play, softer radios)

8. Why is it important to have a quiet space for studying and taking tests? (Fewer distractions to interrupt concentration)

Related Activities

This exercise can be completed with any type of math problems appropriate for the grade level.

Resources

[1] "The Social Impact of Noise", U.S. Environmental Protection Agency, Washington, DC, December 1971, EEC #PG1.

[2] Haakonsen, Harry O., ECO-KIT, E-P Education Services, Inc., New Haven, N.A. EEC #Y113.

Credit

Haakonsen, Harry O., ECO-KIT, E-P Education Services, Inc., New Haven, N.S. EEC #Y113.

A

NAME :

DATE

67 43 + 22	15 86 + 24	41 32 + 79	55 40 + 33
63 91 + 2	9 35 + 61	17 25 + 33	41 59 + 76
93 27 + 42	29 30 + 81	13 80 + 44	50 34 + 19

B

NAME:

DATE:

32
41
+ 79

27
93
+ 42

19
50
+ 34

61
9
+ 35

41
76
+ 59

86
15
+ 24

30
81
+ 29

67
22
+ 43

55
33
+ 40

25
17
+ 33

91
2
+ 63

80
44
+ 13

Litter Kits

Curriculum Topic

CITIZENSHIP AND CIVICS

Environmental Topic

ENVIRONMENTAL QUALITY
Behavior of human populations affects all life

Skills

Acquisition of information:
1. locating
2. organizing
3. evaluating

Subject

Social Studies, Math

Grade Level(s)

3-5

Site

Classroom school grounds, roadside, field trip

Author

Karen Ann Hayward

Objective

At the end of this activity, the student will be able to:

1. investigate an area for litter.
2. recognize what types of litter are discarded and where.

To The Teacher

Litter continues to be an environmental concern. It is indicative of general disregard for environmental quality. This activity pokes fun at polluters in the hope that it will also raise the level of consciousness of its participants.

Before You Begin

Materials: Examples

LITTER KITS ($4.50 each)
(Amounts listed per item)

SCENIC LITTER KITS

Kodak Film Boxes	4¢	Potato Chip Bags	1¢
Cigarette Butts	3¢	Liquor Bottles	1¢
Cigar Butts	1¢	Gum Wrappers	1¢
Soda Cans	5¢	Paper Plates	2¢
Beer Bottles	5¢	Paper Cups	5¢
Plastic Bags	1¢	Plastic Utensils	2¢

ROADSIDE LITTER KITS

Type I

Coke Bottles (collectors item)	7¢
Pampers (5¢ extra, used)	6¢
Wine Bottles (Chablis)	5¢
Plastic Bags	1¢
Potato Chip Bags	1¢
Liquor Bottles	1¢

Type II

Beer Cans	3¢
C & C Cola	3¢
Wine Bottles (Ripple)	2¢
Plastic Bags	1¢
Potato Chip Bags	1¢
Gum Wrappers	1¢
Paper Plates	2¢
Paper Cups	5¢

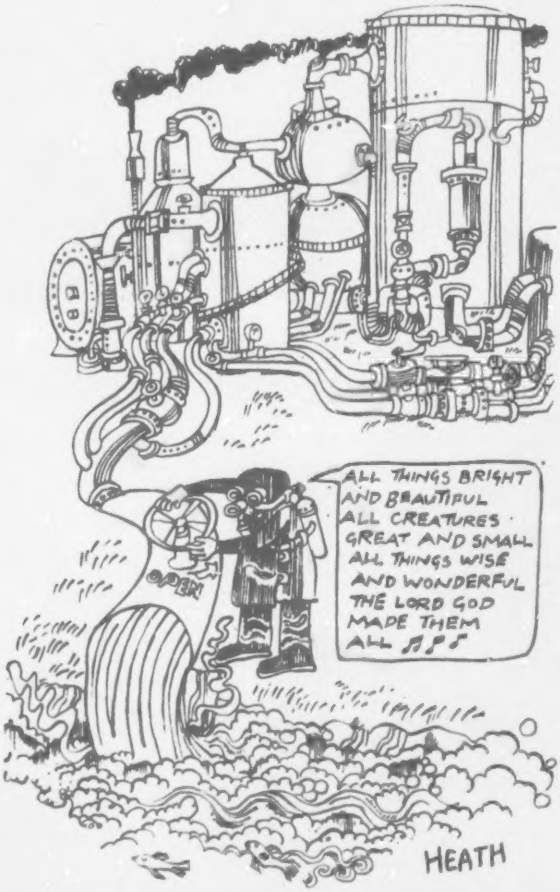
CAMPING LITTER KITS

V-8 Cans	5¢
Plastic Wrappers	1¢
Gum Wrappers	1¢
Liquor Bottles	1¢
Soda Cans	5¢
Potato Chip Bags	1¢
Paper Plates	2¢
Paper Cups	5¢
Plastic Utensils	2¢
Kodak Film Boxes	4¢
Used Coffee Grounds (bunch)	5¢

*It is important that students designate the locations of their findings and understand that they are, infact, cleaning these areas by collecting.

Words To Know

litter, pollution


OPEN
ALL THINGS BRIGHT AND BEAUTIFUL ALL CREATURES GREAT AND SMALL ALL THINGS WISE AND WONDERFUL THE LORD GOD MADE THEM ALL ♫♪♪
HEATH

ACTIVITY

1. Explain the following:
   a. Students are each going to construct a "litter kit."
   b. A "litter kit" is a package of items that are discarded at designated sites.
   c. The students will be given the opportunity to sell their kits to other students. The second group of students are too busy to gather their own litter, but do not wish to be left out of this great American past-time.
2. Ask each student to bring in an item which can house his kit (shoebox, bag).
3. Brainstorm with students to compile a list of major litter areas. Examples: roadside, scenic overlooks, campsites, school yard
4. Students gather litter:
   a. on a field trip (possibly a field trip in another class or for another subject [an extra activity])
   b. on a walk around the school
   c. on their way to school
   d. as a homework assignment to be done individually or for a collection to be sorted by the class as a whole.

5. The students must now price their collected items (see example) and, if it is possible, sell them a.) at tables arranged in the school yard to resemble a bazaar, b.) at lunch, c.) from class to class. In order to sell numbers of these kids, the students will have to develop a "sales-pitch." The student with the highest number of sales can be given a prize.

Discussion:

1. If this seemed to them a silly assignment, ask students if it helped them nonetheless, to learn what types of litter were discarded at which places.

2. Did their research present ironic finds (e.g. film boxes at beautiful areas).

Related Activities

Begin a litter campaign on the school site (e.g. a contest for the person who creates a.) the most litter kits from school yard litter, b.) the most interesting litter kit.)

Littering

Curriculum Topic
CITIZENSHIP and CIVICS

Environmental Topic
ENVIRONMENTAL QUALITY

Skills
Recognizing problems

Subject
Social Studies

Grade Level(s)
3

Site
Classroom

Author
Antoinette R. Giovannitti
Arthur C. Braun, Jr.

Objective

Each child will demonstrate that he/she has actively participated in a project to clean up litter.

To The Teacher

It has been estimated that one billion dollars is spent annually on clearing public and private property of litter. It is further estimated that a litter-fed fire destroys or damages an American home every twelve minutes, and an average of one hundred thirty persons lose their lives annually in trash fires. Litter also provides a breeding ground for disease-carrying insects and rodents. Litter is one environmental problem which can be controlled immediately by citizen involvement. This activity heightens student awareness of litter in the environment, and directs the responsibility of this problem to the students themselves.

Before You Begin

Materials: pencils, paper, construction paper or oaktag for pledge card, Boy Scout or Girl Scout Manuals for pledge format

Words To Know

pledge, litter bug, disposal, trash, litter, prevent, receptacle, citizenship

ACTIVITY

1. Discuss what litter is, where it comes from , and who cleans it up. How can litter be prevented?

2. Tell children that you expect them to become responsible for preventing litter and for taking every opportunity to clean up an area in which they live or play.

3. Motivate each child to compose an original anti-litter pledge. Cite the Pledge of Allegiance as an example of a pledge of loyalty to the U.S. A pledge is like a promise.

MY PLEDGE

I will not clutter my world with candy wrappers and soda bottles.
I will not clutter my schoolground and playground with sandwich bags and milk cartons.
When I play, I will leave sticks in the forest, gravel in the grass and sand in the play area.
I will put my trash in receptacles.
I will remind my friends and family to dispose of trash in receptacles.

STUDENT'S SIGNATURE

PARENT'S SIGNATURE

4. The pledge can then be taken home and signed by parents.

5. A different child's pledge may be read each day and then mounted for display. Short versions may be used for bookmarks.

Have the children discuss with their parents a litter-prevention activity centered about the home. For example, a child and parent will cooperate in cleaning litter from a garage, from a side lot, or from the street and sidewalk which front their home. When the litter is collected, parent and child then sort it for disposal and recycling. Another activity is for the child to make litter bags for the family car(s). Child and parent then make a contract (oral agreement) so that upon completing the task, the parent will sign the pledge card verifying the completion of the task.

Credit

Litter Prevention, A First Step to Improving the Environment, Keep America Beautiful, Inc., N.Y. 10016

Ann-Marie Fleming, contributor

Improve Your School Site

Curriculum Topic
CITIZENSHIP

Environmental Topic
ENVIRONMENTAL QUALITY

Skills
Locating and obtaining

Subject
Social Studies

Grade Level(s)
3-5

Site
School grounds

Author
Antoinette R. Giovannitti
Arthur C. Braun, Jr.

Objective

The student will be able to:

1. identify ways to improve their school site,
2. implement a plan of action for making these improvements.

To The Teacher

The word ecology is derived from the Greek oikos, meaning "house". Setting our individual houses in order may be as important as ordering our collective global house.

We often become so accustomed to our immediate environment that we take its condition for granted. Reflection, however, often reveals both problems in our living and working surroundings and ways to ameliorate them. Taking time for this reflection heightens awareness of environmental issues by adding new perspectives but also promises to improve our physical and mental well-being.

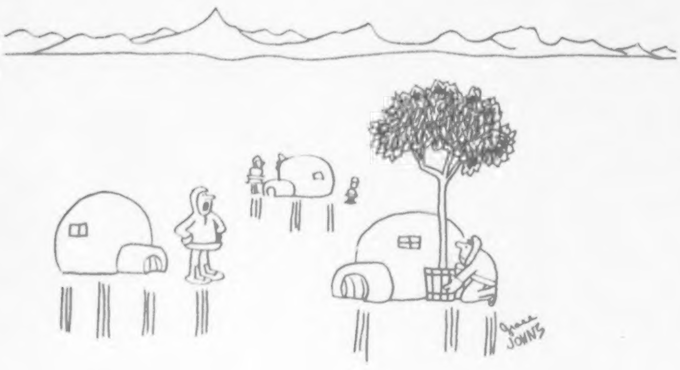
This activity is designed to focus students' awareness of environmental issues on their own schoolyard. It demonstrated the obstacles which may be faced in environmental clean-up efforts and, if such efforts are successful, the rewards of environmental action. It focuses on problems of soil erosion (wearing away by action of wind or water) and compaction (loss of pore space in soil because of overlying material - a loss which reduces gas, nutrient, and water flow to plants.)

Before You Begin

Materials: These will be determined by the class.

Words To Know

erosion, compaction, damage, control, principle, cause, proposals, custodian



" WHAT ARE YA TRYING TO DO — RUIN THE ENVIRONMENT AROUND HERE?!"

Conservation News

Notes To Myself

ACTIVITY

1. Take your students outside to look for areas on or near the school grounds which show signs of soil erosion, compaction, or other damage caused by student activities. Ask them to determine the principal cause of the problem. (Pot holes, eroded sidewalks, abuse of plants and shrubs and other problems unique to your school should be given consideration.)

2. Ask students to suggest and list ways they might control the erosion, avoid further soil compaction, or prevent more damage. Possible solutions might include:

   a. Placing warning signs

   b. Planting the area

   c. Constructing a permanent walkway or trail out of sawdust or bark chips on the path.

3. With the list of suggestions on the blackboard, hold a class referendum to choose one idea for implementation.

4. Obtain permission from the appropriate school personnel to try the measure for improvement upon which they have voted. Before the students try this measure, however, they could ask the person in charge of the school grounds if the suggested solution is being tried now or has been tried. If it has, what were the results? If not, what has the staff done to solve the erosion and/or compaction problem? Students can observe the results of their own solution and discuss:

   a. Is our method successful? Why or why not?

   b. If a warning sign was used, did people obey it?

   c. Which of all our suggestions was the most economically feasible? Did we choose that suggestion? Why or why not?

Related Activities

1. Compile a questionnaire to determine how other members of the school community feel about the quality of the school site.

Resources

Gabel, Margaret, Sparrows Don't Drop Candy Wrappers, New York, Dodd Mead and Company, 1971.

Credit

"Improve Your School Site", Project Learning Tree; American Forest Institute Inc., 1977, pp. 127-28.

Steve Gold, contributor.

Kiddies for Litter Boxes

Curriculum Topic

CITIZENSHIP AND CIVICS

Environmental Topic

ENVIRONMENTAL QUALITY

Skills

Recognizing problems, defining problems, generating alternate solutions, developing a plan of action, citizenship skills

Subject

Social Studies

Grade Level(s)

3 - 5

Site

Classroom, School grounds

Author

Arthur C. Braun, Jr.
Antoinette R. Giovannitti

Objective

The student will be able to:

1. illustrate "litter box" or "litterbag", and create a slogan for an anti-litter campaign,
2. tell where the trash receptacle is most needed or useful for him/herself.

To The Teacher

The goal of education is to produce a well-rounded individual to function in our society with a concern for the welfare of mankind. The classroom situation provides an ideal setting for students to practice good citizenship. The student must realize that as individuals, we are responsible for our own behavior, but that at times, through our influence, we are responsible for the behavior of others. He/she should know that although we wish to think of ourselves as independent beings, we are interdependent creatures--dependent on each other and on our environment. Each of us helps to shape and structure our society. As citizens, we must actively participate in, as well as inform and make others aware of, pertinent issues threatening our existence within the environment. It is the concern and problem of everyone that an average of 16,000 pieces of trash are dropped by motorists on every mile of primary highway in a year. In one state alone, foreign matter on the roadway contributed to 21 fatal and 1,068 non-fatal accidents in one year. The estimated cost of picking up litter from public and private property is in excess of $1 billion dollars.

For added information, you may wish to check with your local board of education, and public works department for costs of litter pick-up incurred by your local community.

Within the classroom setting, the teacher can expose this current litter problem and perhaps involve other classes, the entire school and even the community at large with an anti-litter campaign.

Before You Begin

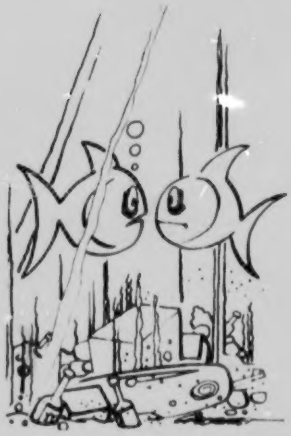
Materials: large paper bag or cardboard box (from student's home); crayons, paint, brushes, wallpaper, fabric, foil, construction paper, glue.

Preparation: Be certain that paper bag or cardboard boxes are brought to school before beginning the activity.

Caution: Placement of the bags/boxes will be determined by the time of the year.

Words To Know

slogan, receptacle, litter, disposal, prevent, trash, citizenship, existence, issue, environment, awareness



Courtesy B.C. Wildlife Review

"Just think, son, some day all this will be yours."

Conservation News 2-7-74

ACTIVITY

1. Discuss the litter problem generally and the students' role in the litter problem. (See To the Teacher for specific information.)

2. As a class, discuss possible locations for litter receptacles. Possible locations include the car, backyard, porch, hallways, lavatories, school entrance, etc.) Which of these locations needs a litter box and which needs an bag?

3. Explain to class that they will be designing litter bags or boxes for use at home or in school. Share some examples of litter bags from commercial sources.

4. How do people who have a product to sell make people aware that it exists? (Through advertisements, slogans, signs, and songs.)

5. What do we mean by slogan? (Catchy phrase; ex. Mikie likes it! Make American Beautiful! Have it your way!)

6. With the teacher, have students brainstorm anti-litter slogans to be used on their "litter box" or litter bag". (Record on board)

7. Ask the students how we could make people aware of the litter problem. (By showing others that we are concerned through the placing of trash receptacles where needed and having a catchy slogan on them to attract attention.)

8. Have each child take out trash receptacle that they brought in from home, i.e. grocery bag, cardboard box, etc., and design the face of each and put on their own slogan.

9. Point out to the students that in order to be good citizens it is necessary not only to know about problems, but also to be active participants who influence and guide others to better our cities, towns and country as a whole. How can we do this with our trash receptacles? Take the designed receptacle home and place in an ideal locations where needed; i.e. family car, bicycle, family boat, hallways, backyard pool.

10. Briefly discuss how placement will affect the awareness of other people; i.e. yard - neighbors, bicycle - community, house - relatives.

Related Activities

1. Students, in small teams of two to three members, will design a trash bag or trash box for each classroom in their school.

2. With the class, write up a brief presentation with the goals and purpose of the trash bag. Have a student copy information onto a blank mimeograph carbon and make copies for each team to read to class when dispensing trash bag or trash box.

Credit

"Litter Prevention, A First Step to Improving the Environment",
Keep America Beautiful Inc., 99 Park Avenue, New York, NY 10016.

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Who is Killing the Ponderosa Pines?

Curriculum Topic
CIVICS AND CITIZENSHIP

Environmental Topic
ENVIRONMENTAL QUALITY

Skills
Recognizing problems, locating and obtaining information, generating alternate solutions

Subject
Social Studies

Grade Level(s)
Adaptable

Site
Classroom/Neighborhood

Author
Cyndi Walsh

Objective

The student will be able to;

1. list the causes of city pollution and its effect on the quality of life.

To The Teacher

Air pollution in cities has caused severe health problems and damaged plants and trees. Since plants renew the air in a closed system, such as earth, this is a vital concern to all. Poor air quality today is caused by a lack of foresight in planning cities (industrial centers). The harmful effects of technological progress can seem of little consequence compared to the many benefits of technology. But, it is essential to build an awareness of the causes and resulting effect of poor air quality as well as a responsibility to maintain high standards of air quality. Incidents of helpless populations trapped by poor air quality are numerous.

In 1948, Donora, Pennsylvania mills and factories poured sulfur dioxide, coal smoke and other gases into a fog.leaving the air smelling like rotten eggs. Thousands of people suffered from sore throats, headaches, stomach aches and burning eyes. Twenty people died from this dirty air that stayed foggy and polluted for four days. In the 1950's and 1960's similar conditions in London and New York killed thousands of people.

Awareness of such problems is growing. Radios broadcast the air quality index and recommend activities for the day. Air quality standards bureaus watch and report on level of particulates and smog in city limits. These procedures seem to convey an acceptance of city and suburban life.

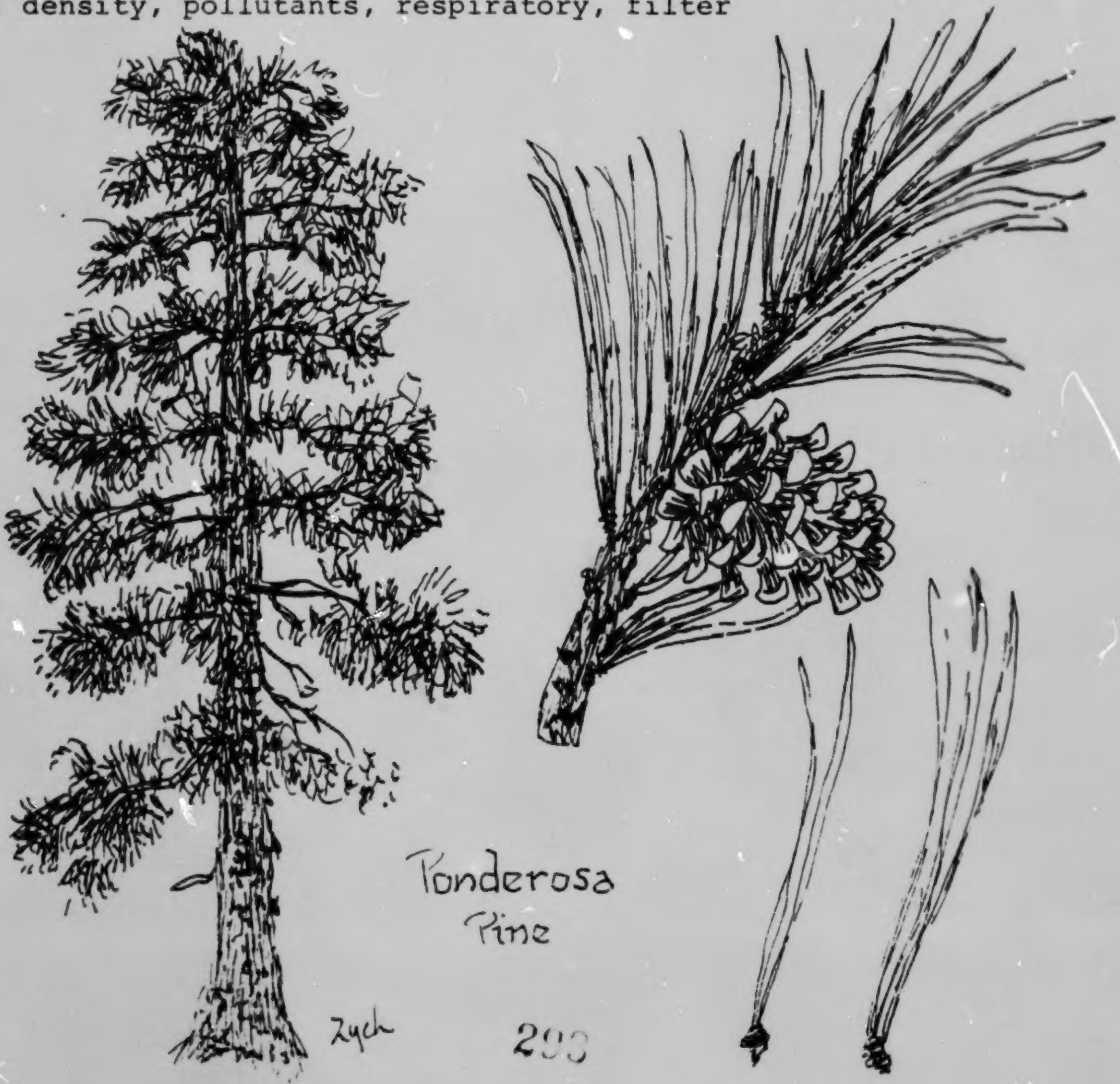
In this activity students will explore the causes and ways to prevent poor air quality on a private, individual level as well as a legislative one.

Before You Begin

Materials: poster paper, art materials (pencils), science resource books, assorted reference library books and periodicals on air pollution

Words To Know

particulates, convection currents, smog, methane, propane, nitrogen oxide, density, pollutants, respiratory, filter



ACTIVITY

1. Preview the presentation topics at the end of the Ponderosa Pine story. Select those adaptable to your groups.

2. Divide class into groups accordingly.

3. Read aloud the "Ponderosa Pine" story.

4. Assign each group a different presentation topic from the list.

5. Each group is to act as concerned forest rangers as they research and present their air quality topic to a "board of the city council."

6. Allow for presentation time.

7. After all presentations are given, ask the class to vote on the most persuasive group with the most thought-provoking and effective presentation. (Pretend city council may be parents, teachers or another group of students.)

Related Activities

1. Write letters to your representatives in Congress. Ask them to be sure that the Clean Air Act is enforced and obeyed.

2. Insist that auto makers design a clean burning car engine.

Resources

Oswald, J., Planet Earth, Houghton Mifflin Social Studies Program, 1976.

Credit

ECO-NEWS, Environmental Action Coalition, 156 Fifth, Ave., Suite 1130 New York, NY 10010.

Drawing: Cecelia Zych

Notes To Myself

STUDENT PAGE

PONDEROSA PINE

As a park ranger you are aware of the dangers of air and water pollution to wildlife in our nation's parks and forests. You believe that the pollution from a neighboring city has caused damage to the Ponderosa pine trees. You have noticed that the long needles that collect carbon dioxide and nitrogen from the air have lost their healthy, dark green color. The weaker trees have turned yellow because they need the gases to breathe and make food. Many will die if the cause is not determined.

Many people think that an insect or disease may be attacking the pine trees. You must convince them that the real problem is automobile exhaust and industrial pollution from a city 60 miles away.

The city council has planned a hearing to determine potential pollution problems. Each group of park rangers will make a chart and poster presentation explaining one aspect of the pollution problem. They will then attempt to convince the town council that air pollution has resulted in tree damage. The topics are as follows:

1. The gasoline engine: carbon monoxide and other wastes come from incomplete combustion in the engine, up to 3 lbs. per gallon of gas from the exhaust pipe of an efficient gas engine car exhaust system. You may:

   a. illustrate findings in a dramatic poster (i.e. weight of exhaust from a full tank of gas).

   b. compare standard size vs. compact car

   c. demonstrate how a gas engine works.

   d. compare gasoline to diesel engine.

   e. talk or write to automotive manufacturers to determine what is being done to reduce exhaust

   f. invent a pollution-free car

   Convince the town council that overpopulation by the automobile has a profound impact on air quality.

2. Draw the CO_2 - O_2 cycle showing how the pines would normally get the gases they need for food and respiration. Using a different color pencil show how the car exhaust in the cycle affects the food making ability of the Ponderosa pine.

3. Draw a diagram showing how car exhaust and pollution from the problem city can flow up into the mountains by convection currents and thus damage the pines. (Use the land-breeze and sea-breeze theory)

4. Show how smog is formed. When gasoline is burned, methane and propane are created. These gases are not usually harmful by themselves. But when they combine with nitrogen oxides and soot they form smog. (Air pollution we can see.) It often looks yellow-brown and seems to hang in the air. Explain the process to the council.

5. Factories, electric power plants and incinerators cause air pollution. Make your own darkness key to determine colors of smoke from stacks. Lightest to darkest smoke.

Measure the darkness (or density) of the smoke coming from smokestacks in the city by comparing it to a density chart you have made. Check the smokestack at different times of the day. The darker the more harmful gases and particulates (bits of ash and soot) it will have in it. Present your findings to the town council.

6. Make a particulate count of the air environment. Attach a loose strip of tape to the outside of a piece of cardboard .Attach this to the outside of a window. Check the tape with a magnifying glass to see the pollution in the area at different times during the day. Report to the council.

7. Air pollution is also unpleasant because it dirties walls, windows, and clothes. Other pollutants can kill plants and harm the animals that eat plants. Pollutants can become part of the rain and form strong acids that eat away at metal and stone buildings and damage pine trees.

8. Many industries that burn fuel now use pollution control devices. These new inventions clean air in the smokestack. As people become more concerned about the environment, government and industry will seek new ways to control the pollution problem.

For your presentation to city officials, prepare a poster or models that show the new pollution control devices that should be used to protect the forest:

a. Fabric Filter - takes dirt out of the air as it passes up the smokestack. Fiberglass is the best material but other fabrics have been successful.

b. Scrubber - removes dirt particles that the fabric filter removes and also removes most of the poisonous gases (sulfur and nitrogen oxides). It sprays a liquid on the pollutants that traps the gases and carries them away before they can escape out of the smokestack.

Pollutants removed by the scrubbing process form a paste-like liquid. It is sometimes put into landfills or in special ponds. The poisonous sludge often seeps out into the ground. This causes another kind of pollution problem for the drinking water. Science has discovered a special chemical to make the sludge into a non-polluting dry cake. This has been used in the newer scrubbing systems. Researchers are trying to turn cakes into building materials so that waste can be made useful. Perhaps you can brainstorm another way of using these pollutants removed by the scrubber.

Litter Monsters

Curriculum Topic

MAN'S ECOLOGICAL ROLE

Environmental Topic

ENVIRONMENTAL QUALITY

Skills

Observing, recognizing problems, generating alternate solutions, developing a plan of action, developing good citizenship habits

Subject

Social Studies

Grade Level(s)

3 - 5

Site

School

Author

Arthur C. Braun, Jr.
Antoinette R. Giovannitti

Objective

The student will be able to propose and defend reasons why we need to clean up the litter in our environment.

To The Teacher

The goal of education is to produce a well-rounded individual who functions in our society with a concern for the welfare of mankind. The classroom situation provides an ideal setting for young students to practice good citizenship. The students must realize that as individuals, we are responsible for our own personal behaviors, but that at times we influence and are responsible for the behaviors of others. Students should know that although we wish to think of ourselves as independent beings, we are truly interdependent creatures, not only upon each other, but on our environment, also. Each of us helps to shape and structure our society. As citizens, we must actively participate in pertinent issues threatening our existence with the environment.

It is the concern and problem of everyone that each year an average of 16,000 pieces of trash is dropped by motorists on every mile of primary highway. Statistics show that in one state, foreign matter on the roadway contributed to 21 fatal and 1,068 non-fatal accidents in one year. The estimated cost of picking up litter from public and private property is in excess of 1 billion dollars. (For added statistics pertinent to your town, you may wish to contact the Board of Education and Public Works Department for costs of litter pick-up incurred by your local community.) In the classroom, students can become aware of this litter problem and enlist active involvement from other classes.

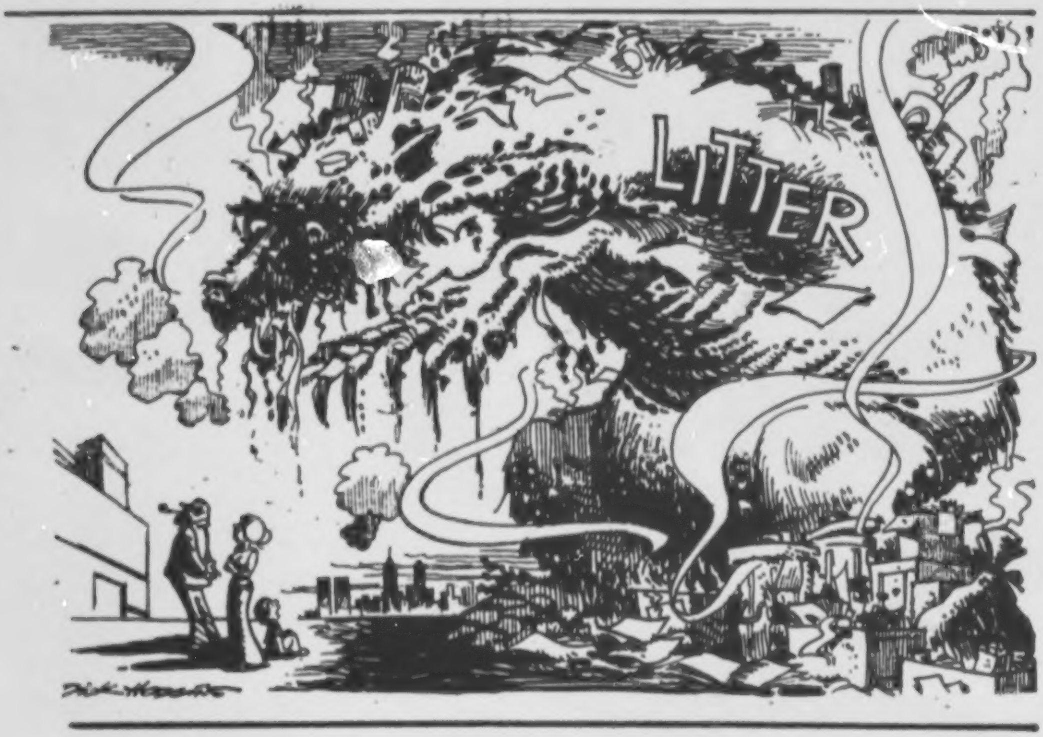
Before You Begin

Materials: oak tag (12" x 18"), glue, hole punch, string, masking tape, collected trash, 3-4 large cardboard boxes for trash, oak tag (one piece 36" x 48"), yarn, magic markers.

Caution: Take precautions when collecting trash. Avoid chewed gum, broken glass, used kleenex, decaying food, etc.

Words To Know

collage, litter, receptacle, prevention, trash, citizenship, disposal, environment



The New York Daily News, July 22, 1978

ACTIVITY

1. Discuss the litter problem and the students' role in solving the problem.
2. Have students collect trash from around the school, hallways and classroom. Put trash into cardboard boxes. Separate trash by types, i.e., paper, wood, bottles.
3. Have students take a brief walk around the school to observe their input in cleaning up the litter.
4. Upon returning to the classroom, discuss the value of their input in the cleaned up areas. How has the clean-up affected the area? Consider aesthetics, safety. List ideas on the board.
5. Students will choose from the trash collection any materials that would be appropriate for a collage on oak tag (12x18). Create a trash monster from oaktag. Fill the monster's stomach with a trash collage.
6. Discuss with students where trash was found around the school.
7. Students will make a map of the interior of the school and the schoolgrounds. Using an (X), students will plot the trash areas on the map. Are there areas which accumulate many X's? Where are these areas? Why do these areas attract litter?
8. Display collages and map in a central place in the building (near the main entrance or cafeteria). Attach pieces of colored yarn from the collage to the polluted areas on the map to indicate where trash was found.

Related Activities

1. Use the map and collage to involve other classes in a litter pick-up campaign.
2. Sponsor an Anti-Litter Day.
3. Assemble a Pollution Scrapbook. Collect articles, pictures, clippings dealing with environmental problems.
4. Propose an essay contest ("Ten Ways I Help Keep my Town Clean", "A Litter Fantasy", "Are People More Apt to Take Care of a Place that is Clean or a Place that is Dirty?")
5. Construct large papier maché litter receptacles.

Resources

Gabel, Margaret, Sparrows Don't Drop Candy Wrappers, Dodd, Mead & Co., New York, 1971

"Litter Prevention, A First Step in Improving the Environment," Keep America Beautiful, Inc., New York, New York

Thermal Pollution

Curriculum Topic

ECOLOGY - BIOLOGY

Environmental Topic

ENVIRONMENTAL QUALITY - safe waste disposal is important to maintaining the quality of the environment.

Skills

Measuring
Reading tables
Observing and recording data
Infering from data

Subject

Science

Grade Level(s)

4 - 7

Site

Classroom

Author

Maryann Cronin Horgan

Objective

Students will be able to:

1. Use apparatus in a thermal pollution activity.
2. Conclude from data collected that thermal pollution is disturbing and harmful to the environment.

To The Teacher

Thermal pollution describes the harmful impact of heated water on the water source and its biota. Most aquatic organisms have a fairly narrow optimum temperature range for maintaining their physiological comfort. The range at which these organisms can barely survive is somewhat wider (rarely more than about 15 degrees C). Over long periods of time, aquatic organisms can acclimatize themselves to different temperature regimes by shifting their entire range of preferences. But most organisms cannot tolerate rapid or frequent temperature fluctuations, preferring instead a generally stable environment. Many organisms hibernate, estivate or migrate to avoid temperature extremes.

For instance, as water temperature rises, fish initially become more active. However, when the water temperature reaches a certain point, fish enter a state of torpor. In this sluggish state, the fish are unable to feed, even to escape the warm water. Before the thermal death point is reached, the fish die from metabolic causes.

Most thermal pollution can be blamed on electric companies, nuclear power plants, and steam-generating plants. These plants use fresh water as a coolant, then return the water (10-30 degrees warmer than its original temperature) to its source.

In this activity, students discover the problems inherent in thermal pollution when they add warm water to an aquarium. Even in this mini-ecosystem, an abrupt change in water temperature causes changes in the metabolism of the fish, in the growth of algae and in the water current.

Before You Begin

MATERIALS: aquarium with goldfish or guppies and plants, hot plate, 500ml beaker, dittos of Table 1 and Table 2 for class distribution, beaker tongs, red food coloring, thermometer (degrees C)

Words To Know

thermal pollution, diffusion, ecosystem, thermal death point, current, algae

"Come on in—the pollution is at a tolerable level."

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ACTIVITY

1. Students will measure 300ml of water into a 500ml beaker. Add 10 drops of food coloring. Heat water to 80 degrees C.

2. Students will slowly add heated water to the aquarium. Watch the current of warm water as it flows into the cooler, dyed water in the tank.

3. Students will note and discuss all changes - diagram red current, fish movement and plant responses. Make observations for two days. Observations can be made on a rotating basis between class members.

4. Students will examine tables on animal sensitivity to thermal pollution (Table 1 and 2).

5. Teacher can then lead discussion to help students apply their observations to the possible effects of thermal pollution on natural systems (e.g., the Connecticut River in Haddam).

6. Discuss with the class:
   a) the results of their observations
   b) the long-term effects of dumping hot waste into a stream or lake
   c) the main sources of thermal pollution
   d) methods of stopping thermal pollution
   e) making better use of the heated water from industrial processes.

Related Activities

1. Draw a food web for a lake or stream in Connecticut. Describe the possible damages to it from thermal pollution.

2. Investigate the effects of thermal pollution on fish reproduction.

3. Write to the Atomic Energy Commission for information on thermal pollution.

4. Visit the Connecticut Yankee Atomic Power Plant in Haddam Neck, Connecticut.

5. Diagram and label a steam generating plant.

6. Test and observe that living organisms use oxygen faster at higher temperatures. (Refer to Environmental Science, the Natural World Modules, Level 3, Silver Burdett Co., N.J., 1977, chapter 5.)

Resources

Eblan, W., et al., Total Education in the Total Environment, Ch. 7, Pendulum Press, 1971, EEC #B21

Tark, A., et al., Environmental Science, W.B. Saunders, 1974, pp 198-208, EEC # B78

Credit

Richnon, J., Life Science, Steck-Vaughn Co., 1976, p. 170-175, EEC #B186

Steve Gold, contributor

302

Will Our Throw-Aways go Away?

Curriculum Topic
ECOLOGY

Environmental Topic
ENVIRONMENTAL QUALITY

Skills
Observing, intuiting,
organizing information

Subject
Science

Grade Level(s)
3-5

Site
Classroom and school yard
sidewalk or shopping area

Author
Sandy Price

Objective

The student will be able to:

1. identify the variation in rates of decomposition of different solid wastes.
2. discuss problems associated with throwing away solid wastes.

To The Teacher

G. Tyler Miller states in his book, Living In the Environment that "each year our (national) output (of solid waste) could cover the entire state of Connecticut one foot deep in trash." This lesson involves an experiment in which students will watch the process of decomposition of various solid waste materials. The lesson can be linked with classroom study of cycles in nature.

In 1920 the average household in the United States produced about 2 lbs. of garbage per day. In 1969 the amount was almost 5-1/2 lbs. per day. By 1980, it is estimated, each household will throw away 8 lbs. of garbage per day. These figures do not account for the solid wastes that are thrown out as litter. In addition to domestic solid wastes, other sources include: municipal (street sweeping, sewage treatment plant wastes, wastes from schools), agricultural, mining, industrial (from manufacturing plants), and commercial (from businesses and stores).

Not only are Americans wasting the world's dwindling resources with overcomsumption, but are also polluting our land with unwise waste disposal. Current patterns and trends in solid waste accumulation cannot continue. A different philosophy of resource use and improved technology must be developed before we become buried in mounting junk piles.

Some of what we throw away will recycle and return to its original state in nature. But we must consider the time necessary and the potentially dangerous side effects. Burning our trash pollutes the air with gases and unburned particles. Burying our trash has been the best solution for getting rid of it. However, much of what we discard either takes a long time to decompose or, practically speaking, will "never" decompose.

An aluminum can will be broken down into aluminum oxide dust in about 500 years. Tin cans will rust away in about 100 years. The typical plastic bag takes about 240 years to be fully degraded. Glass bottles are virtually nondegradable taking 1,000,000 years to break down into sand-sized particles.

Our throw-aways can be divided into categories of materials according to their ability to decompose and thus recycled in nature:

"Never" Decay	Not Recoverable for Use	Decompose
plastics	metal - rusts away	metal - rusts away, not recoverable for use
glass	aluminum	aluminum - not recoverable for use
		wood, paper, food

In this activity, the student will bury each of these kinds of solids, watch, and record the time required for each kind to decompose (or begin to make a change).

This observation will require a period of a month. A permanent location and chart should be available to record the lenght of time passed and the changes in the materials. Observation could continue for many months if the children are interested and the display is kept intact.

Before You Begin

Materials: paper bags, glass jars, dirt, chart, solid wastes of kind mentioned

Time: time to gather trash, 1 period to set up experiment, 1 month of intermittent observations (longer if desired).

Words To Know

recycle, decompose, pollution

ACTIVITY

1. Collect solid wastes that have been thrown out as litter.
   a. Use paper bags for collection; maybe wear gloves
   b. Groups of children might want to concentrate their trash collection in certain areas, i.e. classroom vs. sidewalks to compare the litter in each area.

2. Sort the trash according to the categories found in teacher notes.

3. Bury 4 or 5 samples of each kind of solid in separate jars of dirt.

4. Add water to moisten dirt each day. Tape a piece of the solid onto the outside of the jar for identification.

5. Make a chart to record signs of decomposition at designated time periods.

6. a. Attach a piece of each solid to the chart for comparison.
   b. If several jars of each type of solid have been set up, a sample might be unburied and attached to the chart at each observation period.

6. Examine a sample of each buried solid at specific time intervals, for example, after 1 week, 3 weeks, 1 month.

7. Discussion
   a. Share observations regarding solid waste materials, i.e. size, color, texture.
   b. Which type of material changed most after one week?
   c. Which types were just beginning to change after 1 week, 1 month, etc.
   d. Which one(s) will probably "disappear"?
   e. Which one(s) might take many years?
   f. What are the consequences of making and throwing away each type of solid?
   g. Which kind would be the worst polluter?
   h. Why is it unwise to use plastic bags to contain our garbage?

Related Activities

1. Do this experiment using different samples of the same category of materials, i.e. all paper products, dyed vs. undyed toilet paper.

Resources

Miller, G. Tyler, Jr., Living in the Environment: Concepts, Problems, and Alternatives. Wadsworth Publishing Company, Inc., 1975, EEC #B79.

Wentworth, Daniel F., Kenneth J. Couchman, John C. MacBean, Adam Stecher, Pollution: Examining Your Environment, Mine Publishing, Inc., 1971, EEC #B42.

My Aching Ears

Curriculum Topic

HUMAN ANATOMY

Environmental Topic

ENVIRONMENTAL QUALITY

Skills

Obtaining information,
evaluating information
(listening)

Subject

Science

Grade Level(s)

3 - 5

Site

Classroom or School Grounds

Author

Arthur C. Braun, Jr.
Antoinette R. Giovannitti

Objective

Students will be able to:

1. discriminate between sounds that are beautiful and pleasant, and sounds that are obnoxious and unpleasant,
2. justify that some sounds are harmful to your ears.

To The Teacher

Our ears are a vital part of our being. The sounds that ears capture, aid us in understanding what others are attempting to communicate to us. The sounds that ears pick up can be pleasant or harsh and unwanted. These unwanted sounds are called "ear pollution" or "noise pollution."

Sound is made by air pressure on your eardrum. When you clap your hands, air is pushed out, and at almost the same time, air in your ears pushes your eardrums inward signaling your brain to give you the "feeling" of a clap sound. The air your hands pushed does not travel to your ears, but the push traveled from your hands to your ears at a speed of 770 m.p.h. moving through the air much as waves move over the surface of water. This moving pressure is a sound wave. The number of sound waves hitting your eardrum each second, controls the highness or lowness of the sound you hear. The strength of sound waves is measured by decibels.

Ear pain is felt if three tiny bones, called "ossicles", are unable to soften sounds that are too loud. Before the sounds enter the inner ear the "ossicles" change the loudness of sounds. If the vibrations from the "loud" sounds reach the inner ear, they may rip and tear tissues that are needed for hearing. But the ears will heal themselves if not seriously injured.

Many people don't yet recongize noise as a pollutant, but ask anyone who lives near an airport, in an area where there is a highway or a construction site, or on a street that is undergoing major repairs, and they will explain to you how unpleasant and annoying "noise pollution" can be.

Other kinds of pollution are from machines used to make and move things, amplified music, car horn blasts and barking dogs.

Noise can make you nervous, affect your sleep, affect your speech and your ability to think. Noise along with other causes has been linked to cases of heart disease, ulcers, mental illness and other sicknesses.

There are positive aspects to loud sounds which aid people. A car blowing its horn warns us of its oncoming presence as we cross the street. A thumping noise from a bike tire warns you that the tire may be flat. Noise can block out another noise---such as music blocking out the sound of typewriters in large offices.

Before You Begin

Materials: battery operated tape recorder (follow-up), music records-pleasant sounds/unpleasant sounds

Preparation: Teacher be certain to make a precorded tape of various sounds within the school building-- i.e. lunchroom, a music lesson, a conversation, a teacher teaching a lesson, soft music, children yelling on the playground, etc.

Words To Know

identify, ear, ossicles, pleasant, unpleasant, vibrations, noise, air pressure, eardrum, decibels

Conservation News

Bill O'Malley

"IT'S OKAY, OFFICER—IT'S JUST A POLLUTION CONTROL MEETING."

ACTIVITY

1. Have the students close their eyes and listen to the "silence" for two minutes.

2. Have them open their eyes and discuss the sounds they heard outside of the classroom. (muted)

3. Repeat Step #1, this time slam the door, drop a book, or do anything to disrupt the silence as well as startle the class.

4. Now ask:
    a. What was the sound you heard?
    b. What happened when you heard this sound?
    c. Was the sound a pleasant one? Why?

5. Play the pre-recorded tape for the class.

6. On the board, list the following categories: pleasant sounds, unwanted sounds, helpful sounds, and have students classify sounds from the tape. (Refer to To The Teacher for discussion.)

Related Activities

1. Have students independently make their own tapes of sounds they hear at home. Students should categorize these sounds just as the in-class activity.

Resources

Schneider, Gerald Dr., "Earth Talk...Explore Your Environment", Washington, DC, U.S. Government Printing Office, 1977.

Credit

Schneider, Gerald Dr., "Earth Talk...Explore Your Environment", Washington, DC, U.S. Government Printing Office, 1977.

"Sound Around", Project Learning Tree, Activity # 12 p. 20.

Gabel, Margaret, Sparrows Don't Drop Candy Wrappers, New York: Dood, Mead and Company, 1971.

Notes To Myself

Air Pollution

Curriculum Topic
CHEMISTRY: components of air

Subject
Science

Environmental Topic
ENVIRONMENTAL QUALITY

Grade Level(s)
3-5

Site
Classroom

Skills
Observation, interpreting data
evaluating information

Author
Arthur C. Braun, Jr.
Antoinette R. Giovannitti

Objective

The student will be able to list three components of air.

To The Teacher

Students may not be aware that "air" is not monomolecular, but is a combination of gases. The composition of our atmosphere (excluding human modifications) is given in the table below:

	GAS	CONCENTRATION (BY VOLUME) ppm	 percent
"Pure" Air	Nitrogen, N_2	780,900	78.09
	Oxygen, O_2	209,400	20.94
	Inert gases, mostly argon, (9300 ppm) with much smaller concentrations of neon (18 ppm), helium (5 ppm), krypton and xenon (1 ppm each)	9,325	0.93
	Carbon dioxide, CO_2	315	0.03
	Methane, CH_4, a natural part of the carbon cycle of the bioshpere; therefore, not a pollutant although sometimes confused with other hydrocarbons in estimating total pollution	1	
	Hydrogen, H_2	0.5	
Natural Pollutants	Oxides of nitrogen, mostly N_2O (0.5 ppm) and NO_2 (0.02 ppm), both pro-		

		CONCENTRATION (BY VOLUME)	
		ppm	percent
	duced by solar radiation and by lightning	0.52	
Natural Pollutants	Carbon monoxide, CO, from oxidation of methane and other natural sources	0.3	
	Ozone, O_3, produced by solar radiation and by lightning	0.02	

[Water vapor may constitute anywhere from a neligible fraction to 5% of the air. These values neglect water vapor.]

Air pollution comes from combustion activities (power generation, automobiles, cooking, steel smelting, etc.), industrial emissions (metallurgy, crop spraying, drilling, blasting, etc.) and nature (volcanoes, etc.) "Carbon dioxide, CO_2, is a normal component of air (see table) and a part of the carbon cycle in the biosphere; therefore, it is not ordinarily considered to be a pollutant. However, the burning of coal, oil, and natural gas as fuels produces large quantities of CO_2...The present rate of increase of the worldwide CO_2 concentration is about 0.7 ppm (parts per million) per year.

"Carbon monoxide, CO, is a product of the incomplete combustion of carbon or of carbon compounds. CO is notorious as a gas that is colorless, odorless, and non-irritating, yet very toxic. We read of accidental deaths from CO escaping into a room from a faulty gas heater, or of suicides carried out by remaining in a closed garage with an idling automobile. Most of the carbon monoxide in the earth's atmosphere, however, comes from natural sources, specifically from the oxidation of methane that is emitted by decaying organic matter, and to a lesser extent directly from the decay and growth of chlorophyll. Taken together, natural sources of CO account for more than 90 per cent of the worldwide average level of between 0.1 and 0.5 ppm. Since the worldwide concentration of CO is relatively stable, there must be some mechanism for its removal; in other words, it must cycle. The prime reactive agent seems to be microorganisms in ordinary soil; sterilized soil is ineffective.

"These facts do not imply that atmospheric CO is always benign. The global averages do not apply, for example, to cities, where 95 to 98 percent of the CO comes from combustion of fuel by man and where the prevailing levels can be 50 to 100 times the worldwide concentration. For example, the level inside an automobile moving in a heavy stream of traffic on a multilane highway will be in the neighborhood of 25 to 50 ppm. The CO concentration in the exhaust itself, as we mentioned earlier, can reach three per cent or 30,000 ppm. The maximum allowable concentration for healthy workers in industry, for an eight-hour working day, is 50 ppm. A concentration of 1000 ppm can produce unconsciousness in one hour and death in four hours."

Particulates

"Particle size is positively related to the speed of settling... Large dust particles are therefore troublesome only at relatively short distances from their source. Very small particles settle so slowly that they persist in the air for long periods of time and may be carried over long distances, often many miles.

"Viable particles [capable of living] include pollen grains, microorganisms such as bacteria, fungi, molds, or spores, and insects or parts of insects such as hairs, wings, and legs. Viable particles are responsible for many effects that are detrimental to man, including hay fever, some kinds of bronchial asthma, various fungal infections, and air-borne bacterial diseases.

"Nonviable particles [incapable of living] are a vast array of materials, some from natural sources and others from man's activities. The natural materials include sand and soil particles, salty droplets near the seashore, volcanic dust, and even particles of extraterrestrial origin. Man-made particulate pollutants include both organic and inorganic matter. Much of the organic particulate matter is in smoke from the incomplete combustion of coal, oil, wood, and garbage... The products of incomplete combustion of hydrocarbons are many and varied; some are gaseous, others particulate. Among the latter are hydrocarbons related to benzene (C_6H_6), such as anthracene ($C_{14}H_{10}$) or phenanthrene ($C_{14}H_{10}$)...[and] soot particles, [which] are very small and become air-borne pollutants. Their transformations are important because some of these benzene-related hydrocarbons are carcinogenic (cancer-producing), and all sooty smoke contains some of these substances. Therefore, air-borne particulate hydrocarbons must be regarded as potentially hazardous to health.

"Other air-borne organic particles are insecticide dust and some products released from food processing and chemical manufacturing. Inorganic particulate matter originates largely from metallurgical operations, non-metallic mineral production industries, inorganic chemical manufacturing, and the lead used in gasoline." Smog, the eye-stinging haze that hangs over most cities, is produced when organic chemicals in the air react with sunlight.

"The effects of air pollution are many. Particulates, such as soot and fly ash, settle on things and make them dirty. Blown by the wind, these particulates act like sandpaper, eroding buildings and statues. Deposited on buildings, dust "leads to the expense of cleaning and to the wear that results from the cleaning action... The total annual cost in the United Stated of these effects is very difficult to assess but has been estimated at several billion dollars.

"The aerosol particles in cities whose atmospheres are polluted serve as nuclei for the condensation of moisture. Fogginess, cloudiness, and perhaps rainfall are usually increased considerably in contrast with the less polluted countrysides.

"Pollution affects human health significantly...The net toxic effect when various pollutants are inhaled together may be different from the sum of the effects of these same pollutants if they are inhaled separately. An interaction that produces more than a merely additive effect is call synergism. The synergistic affects of air pollution can lead to lung disease and cancer.

"...Most city residents have frequent personal experiences with what we might call the nuisance effects of dirty air. Indeed, if we define ill health simply as the absence of a feeling of physical well-being, then city residents are almost universally the victims of air pollution. Whether the dry mouth, smarting eyes, and offended nose constitute grounds in themselves for limiting pollution of the air is not a trivial question. As we shall see, however, many instances have occurred in which increased air pollution levels have had very serious consequences on the level of health of the exposed population.

"In 1948 Donora, Pennsylvania was a small industrial city of 14,000 people located in the Monongahela River Valley. Operating in the city at that time were a large steel mill, a plant manufacturing sulfuric acid and a zinc production plant. In the fall of that year a temperature inversion occurred, thus preventing the normal dissipation of the effluents from the various industrial establishments for several days...Over the three-day period of maximal pollution, nearly half the population became ill, and 20 died. Most of the deaths were people with pre-existing pulmonary or cardiac disease."

Air pollution also damages plants, livestock, and the aesthetic quality of our environment.

Air pollution is a part of man's impact on his environment. The following experiments will make students aware of three components of air: oxygen, carbon dioxide and particulates.

Before You Begin

MATERIALS: steel wool, soup plate, baby bottle, water, lime water (from druggist), two clear custard cups, drinking straw, tin can, flashlight or slide projector

Words To Know

fumes, chemicals, oxygen, carbon dioxide, particles, petroleum, smear, magnify, lime water

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ACTIVITY

No. 1

1. Instruct students to perform the experiment as follows to discover the presence of oxygen in the air.
    a. Push a wad of steel wool to the bottom of a baby bottle.
    b. Fill it about half full of water and shake well until the steel wool is very wet.
    c. Pour off excess water.
    d. Add one inch of water to a bowl.
    e. Put the bottle, mouth down, into the bowl.
    f. Let the bottle stand until the following day.
2. Discuss the observations and interpret:
    a. What happened to the steel wool? (rusted)
    b. Why did it rust? (Steel wool combined with oxygen in the air that was inside the bottle formed rust.)
    c. What happened to the water? (It rose in the bottle and decreased in the dish.)
    d. Why did the water rise in the bottle? (To take the place of the oxygen in the air that was used up by the steel wool.)

No. 2

1. Review the fact that air contains O_2 and can cause chemical changes. (Even though we can not see oxygen in the air, we proved it exists through experimentation.)
2. The CO_2 experiment is as follows:
    a. Put a small amount of lime water into two clear custard cups.
    b. Take a soda straw and blow into the lime water in one cup.
    c. Place the second cup of lime water out in the fresh air.
    d. Observe until the water turns milky. Note the time before and after.
3. Discuss with the class the observations and interpret:
    a. What happened to thelime water when you blew through the straw? (It turned milky white.)
    b. Why do you think the lime water turned white? (Something in your breath caused the change.)
    c. What in your breath caused the change? (Carbon dioxide)
    d. What happened to the "standing" lime water? (It also turned milky.)
    e. Why did it take longer to turn milky? (There is less carbon dioxide in the air around us than that which we exhaled directly through the straw.)
    f. What can you then conclude about the air around us? (It contains carbon dioxide and oxygen.)

No. 3

1. Review activities No. 1 and No. 2.

2. Ask students to think of anything else that is present in the air.

3. Let's find out...
    a. Pull down shades
    b. Shut off light switch
    c. Turn on a slide projector light or shine a flashlight.

4. Discuss observations and interpret:
    a. Do students see anything in the beam of light that they do not see in daylight? (Dust particles will be dancing in the beam of light.)
    b. Name other ways to observe dust particles.

5. Discuss the conclusion that particulates are also present in the air. How do they get there?

6. Introduce the concept of air pollution to the class.

Related Activities

Collect particulate air pollution on glass slides covered with vaseline and examine under a microscope.

Resources

Schneider, Dr. Gerald, "Earth Trek...Explore Your Environment", U.S. Environmental Protection Agency, Washington, D.C., 1977, pp. 13-17

Credit

State Dept. of Education of South Carolina, J. G. Ferguson Publishing Company, 1969; from Environmental Exchange - a beginning...; U.S. Government Printing Office, 1974

All quotations from To the Teacher are from:

Turk et al., Environmental Science, W.B. Saunders, 1974, pp. 339-373

Antoinette Giovannitti, contributor

Notes To Myself

People Change the Weather?

Curriculum Topic

METEOROLOGY

Environmental Topic

ENVIRONMENTAL QUALITY

Skills

Recognizing problems, analyzing information, experimenting

Subject

Science

Grade Level(s)

5

Site

Classroom

Author

Cyndi Walsh

Objective

The student will be able to list the causes of weather and show an understanding of how people affect weather.

To The Teacher

The environmental aspects of weather are of growing concern to scientists and industrialists alike. Scientists, convinced that large metropolitan and industrial cities have a great impact on oxygen and water cycles, feel that an increased understanding of meteorology is vital for the survival of future generations.

Simple movements of air have a great deal to do with weather and the quality of the air we breathe. Air rises as it is warmed and is replaced by a cooler dry air mass. This movement, caused by the sun's radiation, carries polluted air away from urban centers and refreshes the necessary oxygen supply.

In this activity students will discover the fundamentals of meteorology and the impact of pollution.

Before You Begin

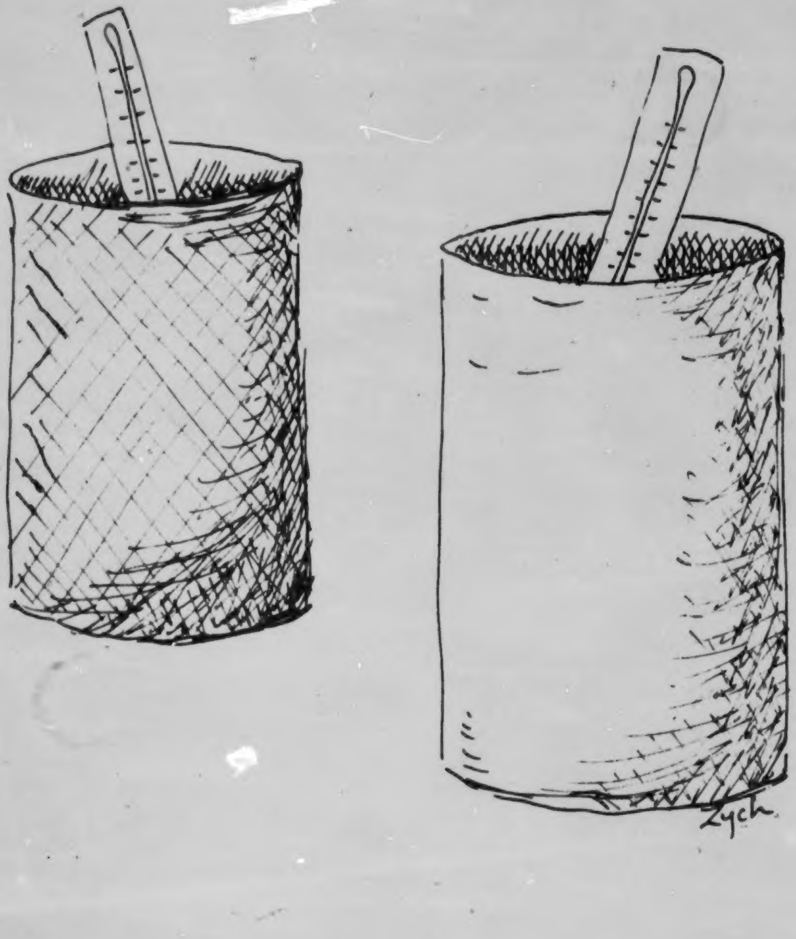
1. Preview student information sheet parts 1,2 and 3 to determine which part (or parts) best suit your class.

2. Duplicate student information sheet.

Materials:
2 thermometers, 2 tin cans, black paint, saw dust or chalk powder, ice cubes.

Words To Know

convection current, energy, temperature inversion



ACTIVITY

1. Divide class into groups and appoint a group leader.

2. Distribute student information sheets to leaders.

3. Assign an activity to each group.

4. Allow for independent research and completion of the activity.

5. Schedule presentation times.

6. Discussion should follow each group presentation.

Student Sheet: Part 1

When sunlight reaches the earth some of it is bounced away (reflected). Dark colors absorb or hold the sun's energy, creating warm surfaces like the cement and asphalt in the city. The following experiment shows this relationship of heat and light.

1. Obtain 2 tin cans with labels removed.

2. Paint one of the cans black.

3. Put a thermometer in each can and place in direct sunlight.

4. Check the thermometer in an hour. The black can will have absorbed more heat from the sun.

5. To measure the amount of heat energy absorbed by the ground and by water, do the following:

    a. Using the same cans fill one can with gravel and the other with water.

    b. Put thermometers in each and place in direct sunlight or under a strong lamp for two hours. The can of gravel represents land forms and the other can represents bodies of water.

    c. Which heats faster, the land or the water?

    d. Why do most people want to spend summers near the water?

Part II

The sun also heats the earth's air. Warm air causes winds. During the day the land heats up faster than the water so the air above the land becomes warm and rises. Cool breezes off of the water rush to take the warm air's place causing a sea breeze. This movement of warm air has a great deal to do with the quality of air. As the warm air rises it takes the pollution away with it. Try these experiments:

1. Put some fine powder-like chalk or saw dust in a beaker of water which is being heated to see the particles move to the top of the beaker. Just as the warm water rises, so does warm air.

2. Compare the temperature on the floor to the temperature near the ceiling. Which do you think will always be warmer? Why?

In the earth's atmosphere as warm air rises it becomes mixed with the cooler, cleaner air. But sometimes this does not happen and a temperature inversion results. Warm air does not mix with the cooler, cleaner air but instead sits on top of the air mass that rushed in to take it's place. While stationary, the air mass traps the city below in its own pollution. This has caused many people and animals to become sick and die.

Find out about the temperature inversions in London, New York City, Donora, Pennsylvania and San Bernadino, California.

Part III

Some scientists believe that the changes we have made in our environment could accidently change the earth's climate. The burning of fuel produces carbon dioxide (CO_2). Extra CO_2 in the air will cause what scientists term the "green house effect," trapping much of the sun's heat and making the earth hotter. List the many ways this would change the world as we know it.

Other scientists believe that the earth's climate is becoming cooler. Air pollution, dirt and waste gases, from cars, jets, and industries are blocking the sun's energy. Improper farming methods and erosion also contribute to the decreased sun energy. If the light from the sun is blocked by our atmospheric conditions, the world's temperature will decline.

List the consequences of a colder climate for the world. Now you can see that the study of meterorology is very important to the future.

Related Activities

Decide if you support a declining or increasing world temperature. Write an editorial for a pretend newspaper explaining your belief and ideas. Make a list of things you will do to face the dramatic change in climate. Cities have caused great changes in the natural things around them. Make a list of the many things cities have changed. Put a plus sign for the good changes cities have made and a minus sign for the bad.

Resources

Eco News, weather report environmental newsletter for young people, Vol. 5, #7, New York, New York, March, 1975.

Credit

Drawing: Cecelia Zych

Rain Cycle

Curriculum Topic

METEOROLOGY

Environmental Topic

ENVIRONMENTAL QUALITY

Skills

Listening with comprehension, recognizing problems, brainstorming, speaking

Subject

Science

Grade Level(s)

3 - 4

Site

Classroom

Author

Betsy Giovine

Objective

The student will be able to:

1. identify the water cycle and the origin of rain,
2. identify causes of water pollution,
3. devise methods to reduce water waste and water pollution.

To The Teacher

Water is essential for survival. The increased use and misuse of it strains the supply.

Water is a renewable resource, being constantly recycled through the water cycle. But humankind is depleting fresh water supplies faster than they are being replaced.

This occurs even though people's usage of water is merely a tiny diversion of the total flow through the water cycle. When added to the natural flow of fresh water from water tables, aquifers, and inland surface waters to the atmosphere and the oceans, man's activities can alter the balance of the water cycle. This can cause a steady reduction in stocks of available fresh water while atmospheric and oceanic stocks increase. Already, in some areas, ground water supplies are decreasing.

Of the water man withdraws from the water cycle, only about 60% is returned in usable form. The rest is lost in evaporation or is polluted badly enough as to be unusable. Since usable water-fresh, unfrozen, sufficiently clean and accessible-is only about 0.003% of the world's total supply, there is a risk of running out of water that is clean enough for consumption even though this resource appears to be abundant.

Ideas to decrease water use are as follows:

1. Place a brick in the tank of your toilet-this cuts down on the number of gallons used per flush.

2. Plot the amount of water used everyday (brushing teeth, drinking, washing) see if you can cut down your own personal water use (turn water off while brushing teeth, check for water running uselessly.)

3. Time showers and see how you can cut down on the time the water runs.

4. Find out which industries in your town dump their wastes into nearby waters. Ask town representatives what is being done to alleviate this.

5. Organize a "Clean the Water Day"collect all rubbish near water sources (ponds, rivers, shore).

6. Have a class discussion on how to save water in the classroom (limit drinks at water fountain, specify time allotment for washing up.)

These are just a few ideas to help if the class needs direction during the brainstorming activity.

Before You Begin

oblong or pie-shaped pyrex/glass pan, large paper for taking notes (chart paper), copies of "Drip the Drop", water

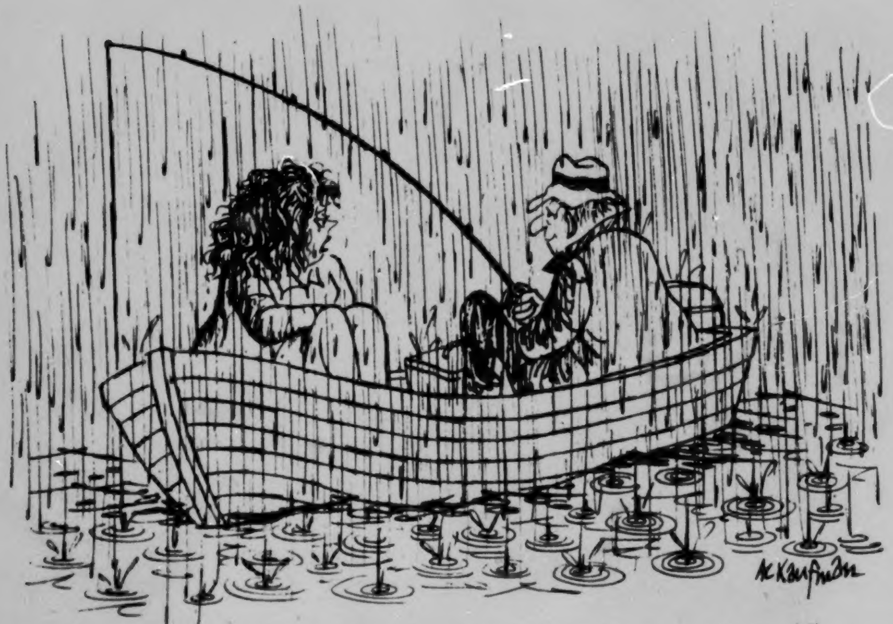
Preparation:

1. At least 4 days before the lesson fill a pyrex/glass pan with water and explain to the class that it will be used for a discussion later, and that it should not be disturbed. Place the pan on a counter near a radiator, if possible.

2. It would be helpful to draw a diagram of the rain cycle on the blackboard for references during the lesson.

Words To Know

pollution, evaporation, condensation, precipitation, rain cycle



"I HAVEN'T HAD SO MUCH FUN SINCE I CLEANED THE OVEN!"

Conservation News

ACTIVITY

Part I - Motivational Discussion

1. Ask a student to explain what he/she observed in the pyrex/ glass pan (no water left.)

2. Ask the class what they think happened to the water. (general discussion)

3. Pass out copies of "Drip the Drop." Read orally and discuss together. Draw the students' attention to the diagram of the natural water cycle.

4. Explain that as rain falls the water is absorbed into the ground, cleaned (filtered) and the evaporation process begins again.

5. Explain the terms precipitation, condensation, and evaporation if you have not already done so.

6. Ask if anyone knows what the word "pollution" means. Explain the term if a general discussion does not stimulate a satisfactory definition.

7. Discuss how water is misused and polluted (humans, industry).

Part II Brainstorming

1. Split the class into three groups.

2. Explain their roles in the activity, each group is a committee working to prevent water pollution and waste of water. One group will concentrate on the school environment, one on the community environment, and one on the home environment.

3. Appoint the committees.

4. Tell the class that each committee's task is to brainstorm or think up as many ways as possible that would (a) save water, (b) keep water clean within the assigned environments.

5. Distribute chart paper for recording ideas. Remind the class that brainstorming can be as creative as they want it to be. The idea is to get as many ideas as possible.

6. Sharing time-when you feel the class has had enough brainstorming time, have each group display their list and explain their suggestions.

Related Activities

1. Have each group choose one of the brainstorming ideas from their list and organize the implementation of it. Remind them to choose one of the ideas that is within their reach.

2. Visit a sewage treatment plant.

3. Display nature's way of filtering water:

   (a) plug a hole in a flower pot with cotton

   (b) add layers of sand and charcoal

   (c) pour muddy water into a pot and drain into a glass jar

   (d) describe the appearance of the water - this shows nature's way of filtering ground water.

4. Try "Desalt of the Earth," "Thermal Pollution," and other activities included in the notebook.

Resources

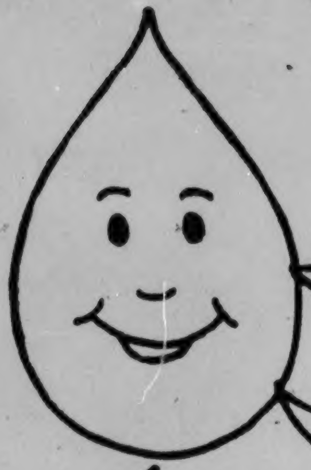
Pruett, Susan and Carol Harrington, "Environment and Population - A Manual of Learning Activities for Elementary Grades", 1975, EEC #146.

Miller, G. Tyler, Living in the Environment, Wadsworth Publishing Company, 1875, pp. 247-255, EEC #B79.

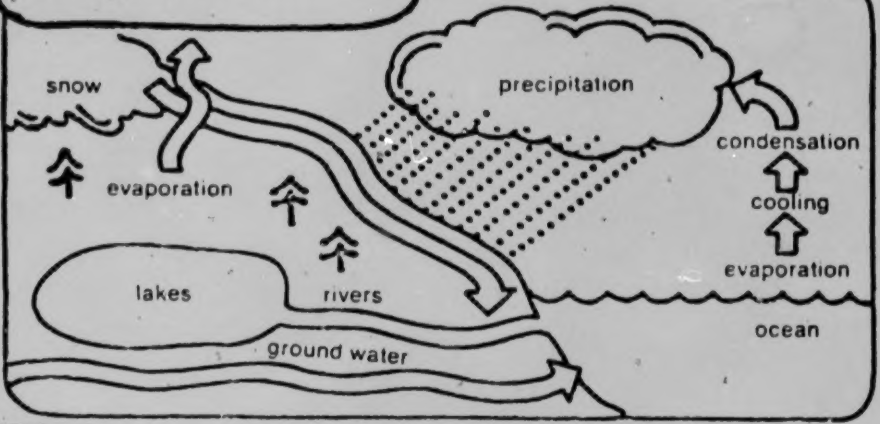
Notes To Myself

Hi! I'm DRIP the water drop

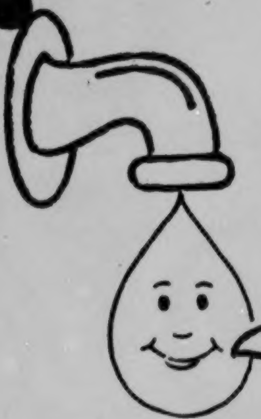
I've been on earth a long time. Years ago dinosaurs drank me . . . and you might have drunk me yesterday. Tomorrow no one will be able to drink me unless you keep me from being polluted.



In case you didn't know, this is where I usually live—in the natural water cycle.

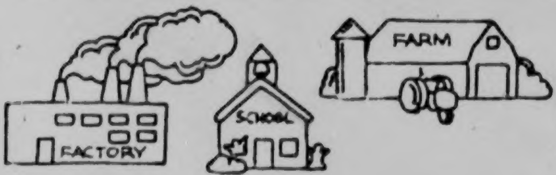

snow
evaporation
precipitation
condensation
cooling
evaporation
lakes
rivers
ground water
ocean

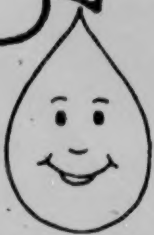
Sometimes I'm borrowed from the natural water cycle and used by you. Do you know how I get from the cycle to your home?



Sure I come from a pipe. But before I was in the pipe I was drawn from a *river, reservoir, well, lake,* or *ocean.* And on the way to your home I am usually cleaned at a purifying plant.

Others borrow me from the natural water cycle too. Here are some. Can you think of others?


FACTORY
SCHOOL
FARM



What would they want me for? Listen to this!

It takes 150 gallons of water to make the paper for one Sunday newspaper . . .

. . . 650 gallons of water to make the steel for one bicycle . . .

. . . 75 gallons of irrigation water to grow just one ear of corn . . .

. . . and 200 gallons of water to make the rubber for one car tire.

It's nice to be needed by so many people . . . but being popular is a problem . . . for you and for me.

© 1973 McDonald's Corporation

Noise Pollution

Curriculum Topic

ENERGY FORMS

Environmental Topic

ENVIRONMENTAL QUALITY
ENVIRONMENTAL ETHICS

Skills

Listening, estimating, evaluating information

Subject

Science

Grade Level(s)

5

Site

School grounds

Author

Carla McGeeney

Objective

The student will be able to:

1. estimate the noise level in a given area
2. give examples of noise pollution
3. suggest ways in which to reduce noise pollution

To The Teacher

Noise pollution is one form of pollution which we often ignore. We have become accustomed to loud music, jackhammers and jets, the noise from which can slowly impair our hearing.

"The public-and many of its elected officials and government administrators-is intimidated by an alphabet soup of decibels and noise scales. It is almost as if the noisy machine is protected by a wall of measuring systems and units. Trying to define noise and quantify human response has become a substitute for seeking to achieve a less noise-stressed civilization. Quality is dictated by statistics and formulae, not by intuition and common sense."

"The relative intensity of sound is usually measured in decibels. Although decibels are not easy to understand, some facts, and Table 1, will make it possible to feel a little more comfortable with the term.

So sensitive is the human ear that it can hear a wide range of sound pressures, with a spread of many millions of pressure units. This wide range has been compressed into a more workable range of 0 to 140 decibels (somewhat higher if we include such sounds as cannon fire and rocket noise). Unlike inches or cubic centimeters, decibels are on a dimensionless scale of values.

The decibel system has several unique features. Though its basic reference point is 0 decibels, zero is not silence or the absence of sound. Zero decibels represents the threshold of audible sound for a healthy young set of ears.

More important, decibels do not progress arithmetically; decibels are logarithmic. This means that each change of decibel level represents a sizeable change in acoustic energy, enabling the system to cope with the wide range of audible sound. Another rationale for the use of a logarithmic system is that the ear perceives differences in sound intensity detectable by the human ear.

To give an idea of decibel progression, a given sound at 10 decibels has ten times the intensity of a sound at 0 decibels; at 20 decibels it has 100 times the intensity at 0 decibels; and at 30 decibels it has 1,000 times the intensity at 0 decibels, etc. We can say then that decibels are small numbers that represent large quantities of sound energy. Decibels are measured with a sound level meter."

The following charts show sound levels found in different environments. The charts may be helpful in explaining the seriousness of the problem to the students. There is a possibility of hearing loss if the decibel level is over 70-90. The purpose of this activity is to teach students to recognize acceptable and unacceptable ranges of noise.

Before You Begin

Materials: pencils, paper

Preparation: make copies of the chart "People and Noise" for each student.

Words To Know

decibel, noise pollution

CHART 1

dB Level	Effect on People	Description of Noise Level
0	Just barely noticeable as sound	
10	Just audible to a person with good hearing	
20	Softest sound the average person can hear	
30		Very Quiet
40		
50	Mild annoyance begins	Quiet
60	Normal speaking conversation level	
70	Comfortable conversation impossible	
80	Noticeable annoyance develops	Loud
90	Hearing can be damaged if noise is continuous. Work efficiency decreases.	
100		Very Loud
110	Noticeable ear discomfort	
120	Probable permanent hearing loss	Uncomfortably Loud
130	Strong "tingling" sensation in ear	
140	Sharp pain in ear	

CHART 2

	Noise level	Response	Hearing effects	Conversational relationships
Carrier deck jet operation	140			
		Painfully loud		
	130	Limit amplified speech		
Jet takeoff (200 ft.)	120			Shouting in ear
Discotheque				
Auto horn (3 ft.)		Maximum vocal effort		
Riveting machine	110			
Garbage truck	100			
NY subway station		Very annoying		
Heavy truck (50 ft.)	90			Shouting 2 ft.
Pneumatic drill (50 ft.)				Very loud conversation-2 ft.
Alarm clock	80	Annoying		
Freight train (50 ft.)				Loud conversation-2 ft.
Freeway traffic (50 ft.)	70	Telephone use difficult		
		Intrusive		Loud conversation-4 ft.
Air conditioning unit (20 ft.)	60			
Light auto traffic (100 ft.)	50	Quiet		Normal conversation-12 ft.
Living room				
Bedroom	40			
Library				
Soft Whisper (15 ft)	30	Very quiet		
Broadcasting studio	20			
	10	Just audible		
	0	Threshold of hearing		

ACTIVITY

1. Explain to students that noise level is measured in decibels. Define and discuss word.

2. From the previous charts give examples of various decibel levels of familiar sounds.

3. Explain to students that many areas of the school are very loud, and that they are going to study the noise level of these different areas.

4. Have students bring pencil and paper and visit different areas of the school. Examples: kitchen area, gym, locker rooms, art rooms, parking lot, music room, lunch room (at lunch time). All students will visit the same areas.

5. At each site, have students use their chart and record the comfort level of noise as: very quiet, quiet, loud, very loud or uncomfortably loud. (This of course, will be a subjective decision for each student.)

6. Return to the classroom and tally the information. From the data gathered find the most often recorded level of noise for each area. Discuss discrepencies and consider that people have varying noise tolerance levels.

DISCUSSION QUESTIONS:

1. Which of the areas was noise polluted?

2. What are some ideas we could suggest to our school to increase the awareness of noise pollution?

3. Are there noises in your life that you would like to stop? When does noise bother you the most? The least?

4. What are some ways individually to cut down on noise pollution?

5. Do we impose on others when we engage in particularly noisy activities? How?

Related Activities

1. Have students record levels in their homes. Have them decide which room is the noisiest. What is the approximate decibel level?

2. Posters could be constructed calling attention to those areas of the school with the highest decibel levels.

3. If there are any "very loud" areas in the school, students could speak, or write, to the principal stating their concerns.

Resources

Chart 1 from "The Sounds of Music" Individualized Science Instructional System, Ginn and Company, 1974.

Chart 2 from EPA, Noise Pollution: Now Hear This, U.S.G.P.O. Washington, 1974 - See chart for full citation.

Quotes in T^3 from R. A. Baron, The Tyranny of Noise; Harper and Row, 1970, pp. 38-40.

Notes To Myself

Knock Off That Racket!

Curriculum Topic

ENERGY FORMS-SOUND

Subject

Science

Environmental Topic

ENVIRONMENTAL QUALITY
The earth's renewable and non-renewable resources must be used wisely to preserve the quality of life for our own and future generations.

Grade Level(s)

3-5

Site

Classroom

Skills

Problem-solving, generating alternative solutions, developing a plan of action

Author

Paul Sanderson

Objective

The student will be able to:

1. explain causes of noise pollution
2. demonstrate ways to decrease noise pollution
3. name substances used to decrease noise.

To The Teacher

The students should be informed of 3 definitions: sound, noise and pollution. Sound is a set of vibrations which have been carried through a medium (water, air or solids). These vibrations are received by the ear through which they travel to be perceived by the brain. Simple equipment for experiments illustrate this definition: turning forks, rubber bands, etc. Noise is excessive discordant or disagreeable sound. (See Decibel Chart included here). Noise pollution is defined as the accumulation of noise in an amount to be detrimental to aesthetics and health or even genetic formation.

Some substances have properties which can decrease sound by absorbing or isolating it, or by providing insulation against it for us. These substances can likewise reduce noise, and be used to reduce noise pollution. You will need to collect such materials to become familiar with the ways and means by which they absorb sound. Later, your students will use them to reduce noise from a source of noise such as an alarm clock buzzer.

The use of a decibel meter may be helpful in this activity, but it is not a necessity. The human ear is a good judge of sound and noise.

Before You Begin

Materials: You will need:

1. a source of noise: something relatively small, loud and not precious. Ringing bells, buzzers, or alarm clocks might work. Electric alarm clocks provide appropriate noise with easy access to on-off controls (Pull the plug!). Control may be an instruction additive if the students are successful in using sound-absorbing materials.

2. a supply of sound-absorbing materials: foam rubber (sheet or chunks from old pillows, furniture), styrofoam (found in packing), paper, newspaper, cardboard, sawdust, wood, plastic (in sheets, chunks), cloth (various materials such as cotton, wool, burlap), glassjars, plastic bottles, straw, sand, dirt. The list will be determined by what is available to you.

3. manipulative devices, such as: tape, string, glue, scissors, knives (be careful!), bags, electric extension cords for electric alarm clocks. These will be used to shape and form your sound-absorbing materials around or to your noise producer. If your materials come in large pieces, you may want to break them into smaller pieces or make them more easily accessible and pliable.

Words To Know

noise pollution, sound, sound absorbing materials, vibration

JamesEstes

Cartoon by James Estes

"Senator, maybe you should change that part about 'beating the drum for noise abatement'."

Conservation News 4-1-74

ACTIVITY

1. Divide your class in such a way so that an equal number of students will be working with an equal number of tools and sources of noise. The fewer students per group, the better.

2. Explain the principles of sound-proofing while students examine the materials with which they will sound-proof.

3. Show students the noise-making devices and explain how each works.

4. Challenge the students: Can they devise a way of "sound-proofing" the noise-making device,by using the materials and tools at hand? Encourage them to be imaginative and to experiment with different substances in combination.

5. Discussion Questions:

   a. What was your source of noise, and what made it noisy? (loudness, buzzing, bell ringing)

   b. (Recall the definition of noise-pollution) Was this noise pollution to you? Why? (Yes, It scared me, hurt my ears, made me angry, was irritating, made it hard to talk, think.)

   c. How could you decrease this noise? (By absorbing the sound, by isolating it.)

   d. How did you do this? (By packing, wrapping, covering smothering, bagging, boxing etc. the noise-maker in sound-absorbing materials.)

   e. What materials did you use?

   f. What materials worked best? Why?

Related Activities

1. Do the activity, but qualify it by asking the student to sound-proof the "noise-maker" with a minimum amount of sound-absorbing materials.

2. Make a noise inventory. Using a tape recorder, survey various areas in or around your schoolto determine kinds and sources of noise. Discuss the causes and ways of limiting noise in shcool.

3. Take the pulse rate of students sitting quietly, and compare rates with those read under exposure to your own noise-makers, or other sources of noise. Is there a rate change? Why?

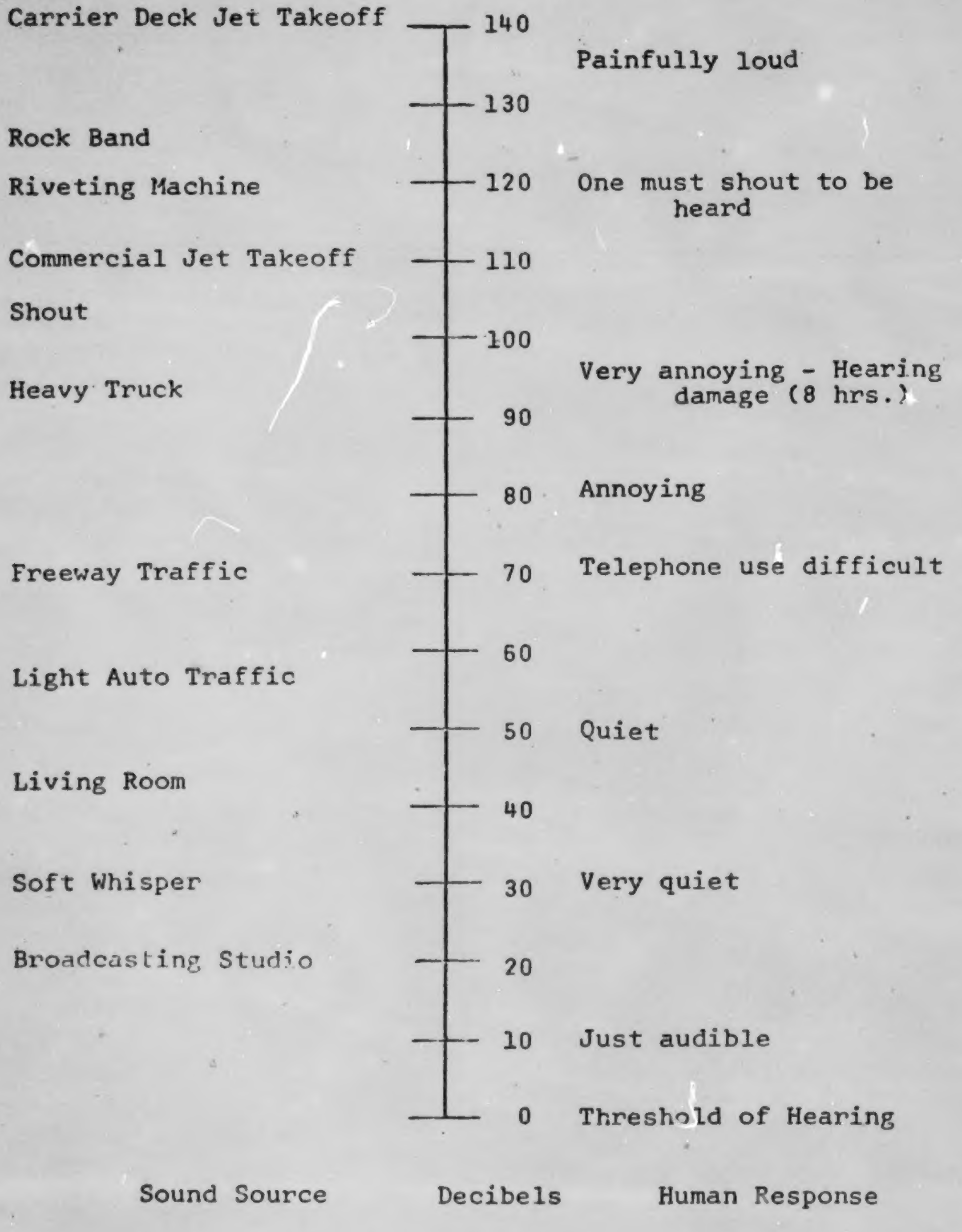
Resources

Hennings, Dorothy Grant, and George, Keep the Earth Clean Blue and Green; Citation Press, 1976, pp. 13-35 EEC #241: Some science social studies, valuing and language arts activities for comment on noise pollution.

Damer, Mary Beth, "Noise Pollution", Environmental Education Center Oteen, North Carolina 28805

Chapman, Thomas L., "Sounds and Noise", Environmental Education Center, Oteen, North Carolina,28805

DECIBEL CHART



Metric System-Over Packaging

Curriculum Topic
METRIC SYSTEM

Environmental Topic
ENVIRONMENTAL QUALITY

Skills
Data collecting
problem solving

Subject
Science

Grade Level(s)
3 - 5

Site
classroom

Author
Cyndi Walsh

Objective

Students will be able to recognize and list over-packaging practices and their effects on our environment.

To The Teacher

In 1930 the average American wasted two pounds of trash per person, per day. In 1970 the average waste per person increased by three pounds or 1800 pounds per year. If current trends continue, the average will soon increase to 8 pounds per person. Thus, solid waste in the United States is increasing faster than the population. Packaging accounts for more than 13% of the total volume solid waste produced. Packaging often goes beyond the function of protecting goods and consumer awareness can help decrease over-packaging. It is a well known fact that the cost of packaging is passed on to the consumer.

The solid wastes with which we are faced today differ from those of the recent past. Glass bottles can be broken to take up less space, and a steel can eventually rusts away; but an aluminum can or a plastic bottle lasts indefinitely. Of the 125 million tons of commercial household waste produced each year, one third is discarded packaging.

Before You Begin

Gram weights, examples of excess packaging, balance scale

Words To Know

Gram, consumer, manufacturer

ACTIVITY

1. Ask students to bring to class examples of over-packaging. Ask students to estimate the weight in grams of the over-packaged product.

2. Weigh the product.

3. Remove excess packaging material. Compare weights before and after removal of packaging.

4. Ask students to find a comparable product that is not over-packaged. Discuss the cost of both products. How much does the consumer pay for over-packaging? (A good example: the variety pack vs. the standard sized boxes of cereal or a box of salt compared to the tiny picnic-sized containers.) What reasons would the manufacturer have for excess packaging? (Better product advertising or display, gimmick items, especially in cosmetics.)

5. Ask students to either (a) write to manufacturers of over-packaged goods with recommendations or (b)acknowledge manufacturers of appropriately packaged goods. (Letter, support poster)

Related Activities

1. Categorize over packaging materials according to biodegradable and non-biodegradable. Discuss implications for our future. Research the process of making cardboard and plastic. Devise a system analysis of the product production. (Step by step procedure, paying close attention to the many forms of energy used in it's production.)

2. Rewrite the Bill of Rights to include environmental quality considerations.

Credit

"Project Learning Tree", Education Research Systems, Inc., American Forest Institute Inc., 1975 #55.

Notes To Myself

ENVIRONMENTAL POLICY

SALEM ZONIN COMMITTEE

ENVIRONMENTAL POLICY

ACTIVITY TITLE — PAGE NUMBER

LAND AT THE CROSSROADS....................................327
"POACHING"..333
HISTORY OF NABONGA......................................339
MAKING DECISIONS THROUGH TALKING ANIMALS..................344

ENVIRONMENTAL POLICY

The singular most important segment of environmental learning is in the area of environmental policy. This area brings together, in an action phase, all six of the other concept areas. The environmental policy phase relies on factual information assimilated in the other areas for the active process of making an effective environmental decision and implementing it.

In the Environmental Education Activities Manual, William B. Stapp and Dorothy A. Cox comment on the need for the study of environmental policy.

> "In many education systems, it is assumed that students who have been through science and social studies investigation somehow know and can utilize skills in problem solving. When such skills are taought in academic isolation, students are left to synthesize the skills into a personally useful process, *if* they can. Since the environmental education model is based on student involvement, problem solving skills are essential to developing and *carrying out* action plans." p. 11

Stapp and Cox continue by defining the steps in what they **have called** community problem solving. Similarly, many policy scientists have identified generalized steps in the policy process for any field. One distinguished policy scientist, Garry Brewer of Yale University, divided the policy process into five phases. The table below compares Stapp and Cox's community problem solving with Brewer's phases of the policy process.

Community Problem Solving Stapp and Cox	Policy Process Brewer
1. Define problem or issue 2. Become informed 3. Identify alternate solutions	A. Initiation i. recognition of problem ii. identification of problem iii. determination of goals and objectives iv. generation of alternatives
4. Evaluate alternate solution 5. Develop a plan of action	B. Selection
6. Implement the plan of action	C. Implementation
7. Evaluate the implementation	D. Evaluation
	E. Termination

It is clear that environmental education community problem solving is clearly related to the generalized policy process.

The policy process relies on factual information assimilated in other areas, a set of values and/or ethics for the active process of making and implementing an environmental decision.

One learns the problem solving process and puts it to a test in a real and simulated decision-making situations. This process integrates content, trade-offs and values into a holistic view.

High School Energy/Environmental Education Training Model: Content Sourcebook prepared by Far West Laboratory for Educational Research and Development, 1978 (Draft version)

Land at the Crossroads

Curriculum Topic

CIVICS, CITIZENSHIP, URBAN STUDIES - Man's use of land sometimes come in conflict with nature's intended use of it.

Environmental Topic

ENVIRONMENTAL POLICY: Environmental decisions should be made only after considering all alternatives and the consequences of each.

Skills

Problem solving
Valuing, identifying alternatives
Group interaction

Subject

Social Studies

Grade Level(s)

4 - 8

Site

Classroom

Author

Paul Sanderson

Objective

The student will be able to:

1. Analyze in discussion and debate, a problem situation which presents strongly opposing solutions by discussing and debating the issue.
2. Work in a group to reach a group decision.

To The Teacher

The use of land in your local community may arouse conflicting points of view. Each individual or interest group has an opinion which may differ dramatically from that of their neighbors. This can be the case when our use of land comes into conflict with nature's intention. In recent years environmental groups have come to the defense of "nature", and have prevented the building of dams and highways that would otherwise have destroyed unique habitats or rare species of plant and animal life. Other interest groups express the sentiment that the natural environment must be compromised, (at least), in order to maintain healthy economic and social development in our society. These are not clearly-defined issues, but they are ones that we all must deal with in our responsibility to local and state government and to our natural environment.

Before You Begin

MATERIALS: overhead projector, screen, paper and pencils, transparencies

ACTIVITY

1. Divide the students into groups of six to eight students.

2. Describe the following, hypothetical situation:

A new high school is to be built. Many of you will attend it. (Show transparency of high school location). It will be very modern: classrooms, labs, shops, cafeteria, gymnasium, pool, student activity room, playfields and park-like grounds. It will replace an old, ill-equipped, over-crowded high school. The site for the new school is well located in your town. It is, however, also the habitat of the Southern Bog Lemming (show transparency), an animal which requires a habitat of a very special nature: wet meadows, swamps and bogs. It is a secretive animal, rarely seen, and considered rare in the area. The architects' drawings indicate that the location of the new school is the present home of the lemmings. (Overlay lemming habitat transparency on high school transparency).

3. Each student is assigned, or chooses to represent an interest group, an individual concerned about the dilemma, or the lemmings themselves. Roles that could be used are: The bog lemmings, high school students, architects, superintendent of schools, teachers, the wet meadow, an environmentalist, naturalist, mayor, construction worker, planning board member.

4. As homework, ask the students to research their roles, giving thought to how the real subject their role represents would feel about the issue at hand.

5. During the next class period, review the issues, and ask each person within the small groups to "speak" for the role he/she is portraying.

6. When everyone in the group has spoken to express their feelings and concerns, open a question and answer period, during which some representatives will lobby their causes. Limit debate to 10 minutes, after which a vote by majority-rule is held. Yes = school is to be built; No = school should not be built.

7. Later, discuss:

a) How some issues are not clear-cut, and decisions about them are not easily made.

b) How did it feel to represent, in your "role", an interest you may not have agreed with personally.

c) Are all community decisions agreeable to all members of that community?

d) Is majority rule always the rule?

e) How can you influence people to see your point of view?

f) What ecological considerations are taken into account in your community and/or state before the land is changed?

Words To Know

habitat, role, zoning, Bog Lemming, majority, conflict, issue, influence, interest group, lobby

Credit

Drawing: Cecelia Zych

Related Activities

1. Ask students to offer alternative solutions to the conflict by brainstorming for 5 minutes.

2. Ask students to indicate their own positions within a continuum, represented on the blackboard in the following manner:

save lemming habitat — build high school

Notes To Myself

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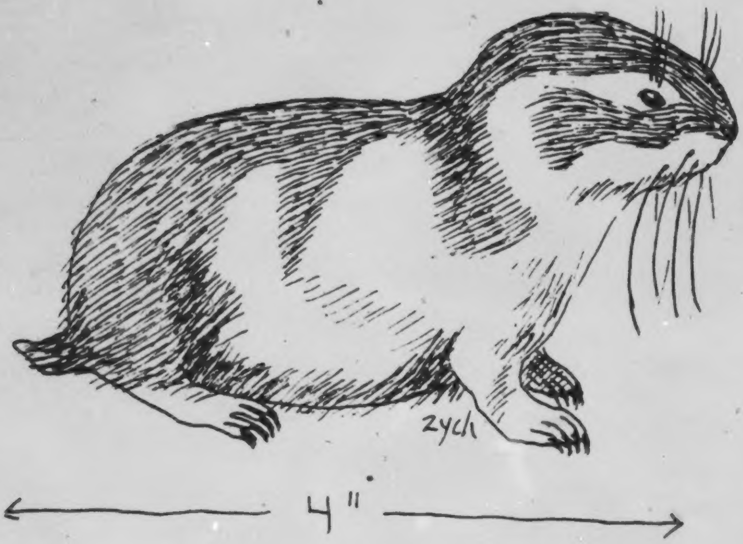
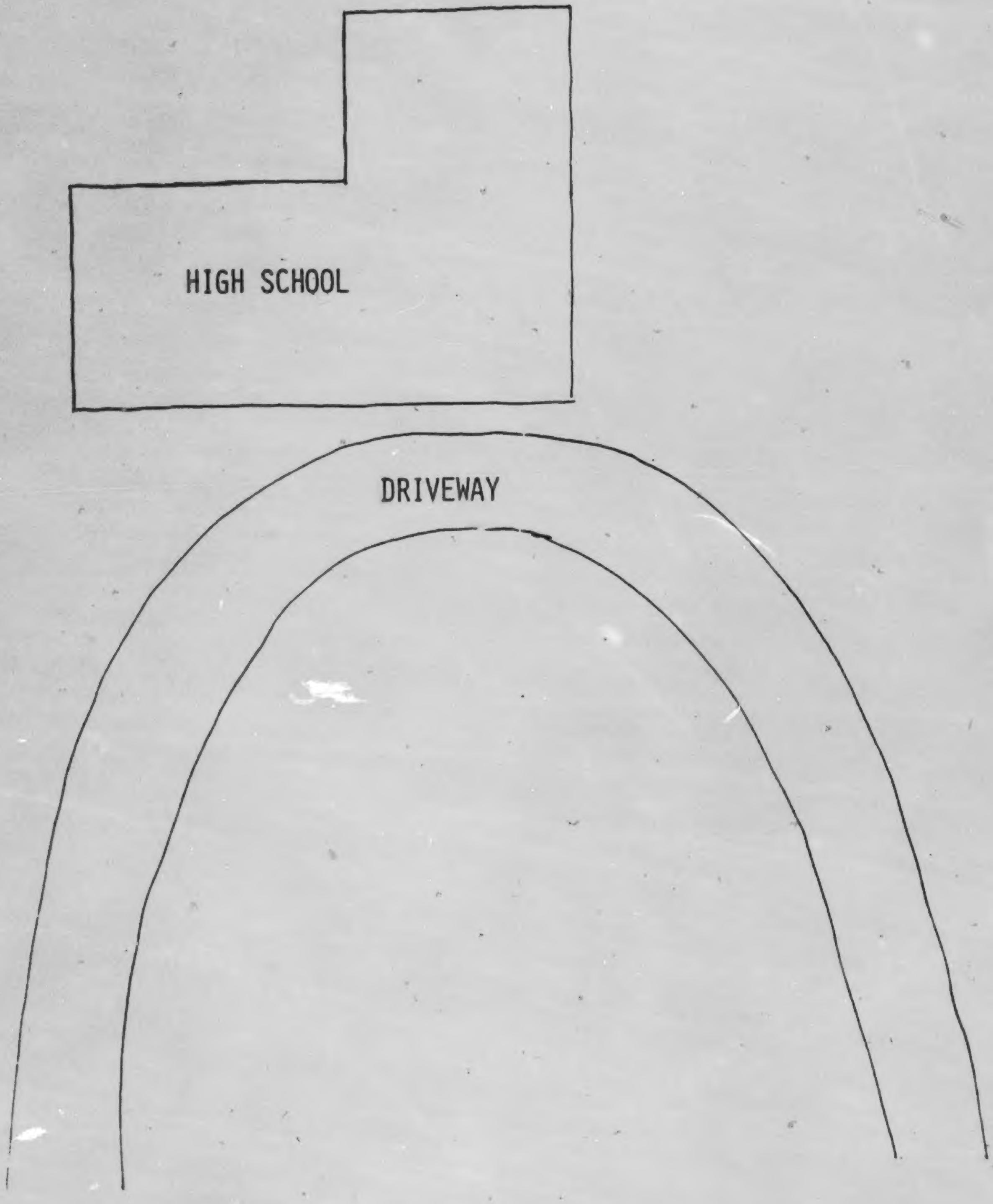
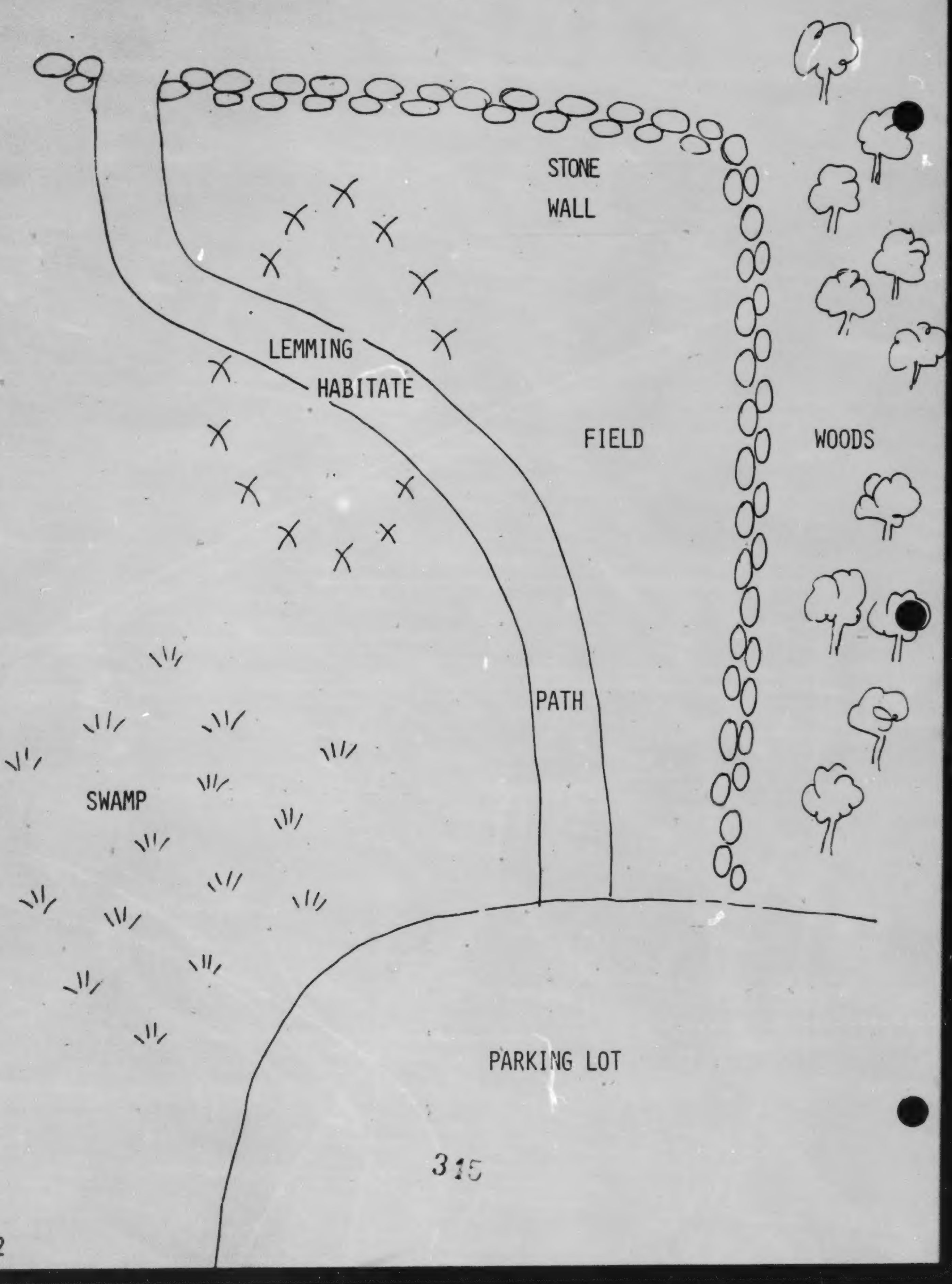
SOUTHERN BOG LEMMING



LIVES IN WET MEADOWS AND BOGS
VERY SECRETIVE
RARE SPECIES
NEEDS SPECIAL HABITAT
EATS GRASSES


HIGH SCHOOL
DRIVEWAY


STONE
WALL
LEMMING
HABITATE
FIELD
WOODS
PATH
SWAMP
PARKING LOT

"Poaching"

Curriculum Topic

AFRICA, CHINA, ARGENTINA
GEOGRAPHY

Environmental Topic

ENVIRONMENTAL POLICY

Skills

Gathering information,
constructing hypothesis
brainstorming

Subject

Social Studies

Grade Level(s)

5-8

Site

Classroom

Author

Cyndi Walsh

Objective

The student will be able to:

1. identify some endangered species in Africa, China and Argentina,
2. analyze factors which affect the interrelatedness of life.

To The Teacher

The following activities serve to reinforce the concept of the interrelatedness of life. It examines food webs disturbed - or destroyed by the demands of world export and import markets. All too often hunting for trade results in endangered species.

Usually the full impact of this hunting of particular species can not be readily observed until it is too late. But many incidents of species removal and the ramifications have been cited.

The first food web, Chart 1, deals with such case histories.

CHART 1

ANIMAL	REASON FOR DECLINE	IMPACT ON ENVIRONMENT
Hippopotamus	Central Africans killed many because crops were trampled by the hippo.	Realized too late that the droppings of hippo fertilized water which contributed to algae growth that fed the main fish product, the "Tipara" - many people went hungry.
Alligators	Argentinians hunted the alligator for its valuable skin.	With the predator of the pirahna (alligator) gone, pirahna populations boomed attaching livestock that watered in rivers. Many times the oldest animal was sacrificed to pirahna so others could cross waterways.
Crocodiles	Madagascar people hunted the crocodile for its valuable skin.	With the predator of the wild dogs (crocodile) gone, populations boomed - dogs carried rabies and bit many people who died of the disease. Also there were increased snake hazards and wild pigs destroyed farmlands.
Jungle cats and owls	Argentinians destroyed many of these animals.	Predator gone - disease carrying rats multiplied and infected the people.

The second part, Chart 2, deals with the "unknown" consequences of species removal. Today we do not know the impact of the loss of these species.

CHART 2

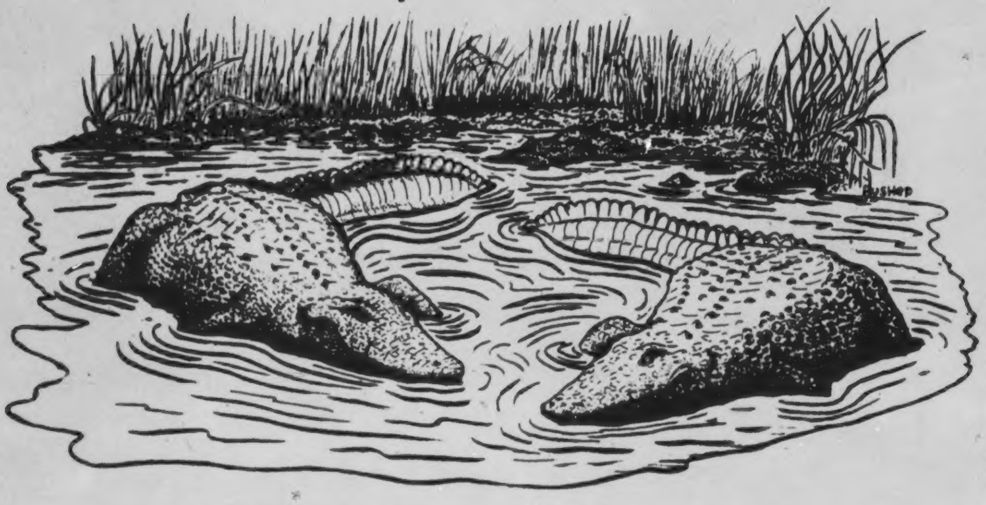
ANIMAL	COUNTRY	REASON FOR DECLINE
Chimpanzee	Africa	Hunted for trophies and sport
Cheetah	Africa	Hunted in South Africa and Southwest Africa
Black Rinoceros	Africa	The horn has been hunted illegally
Syberian Tiger	China/ Sibera	Hunted for its bones, flesh blood (medicinal purposes)
Wild Bactrian Camel	China	Overhunted for food and skin

Before You Begin

Materials: paper and pencil, duplicated Student Pages, animal resource books

Words To Know

extinct, endangered, poaching, predator



"I NEVER CAN REMEMBER. WHAT ARE WE ANYWAY - ALLIGATORS OR CROCODILES?"

Cartoon by Jack Shepherd/NWF Art Department

Conservation News 10-15-73

ACTIVITY

1. Read Student Information sheet aloud. Discuss to set the stage for the brainstorming session to follow.

2. Hand out page 1 of Student Worksheet.

3. For each of food chains on the Student Worksheet, ask students to hypothesize the impact of the removal of the:

   a. jungle cats,

   b. crocodile,

   c. alligator and

   d. hippo

from the ecosystem.

4. After discussion, from the To The Teacher Chart 1, explain to students the actual impact which the species removal had on the local environment.

5. Discuss why it is usually impossible to know the full impact of species removal beforehand.

6. Divide class into groups for part 2 of the activity.

7. Give each group an animal population that is declining as listed on Chart 2 (from To The Teacher). Using a combination of research and brainstorming, ask the group to creat a food chain or web for each specie listed. After food webs are created, ask each group to hypothesize the impact of the loss of the endangered specie.

Related Activities

1. Write to the Chamber of Commerce of the United States and other countries to determine their import-export system.

2. Find out about animals legally hunted and/or exported from the United States (ex. big horn sheep).

3. Compile a list of safe imports that do not impact an endangered species.

4. Make a list of safe and unsafe souvenirs (i.e. Safe souvenirs do not harm the ecosystem when removed. For example, pictures or a diary of a trip as opposed to buying a stuffed toy animal made with real koala fur; taking a "living" thing from it's environment as opposed to a seashell collection.)

Resources

"Wildlife in Danger", Newsweek, January 6, 1975, p. 36-40.

Oswald, J., Planet Earth, Houghton Mifflin Social Studies Program, 1976, p. 247.

STUDENT PAGE

STUDENT INFORMATION SHEET

HUNTING AND ILLEGAL POACHING OF WILDLIFE FOR SPORT AND TRADE CONTINUES DESPITE STRICT CONSERVATION LAWS. IN INDONESIA, THE NEAR EXTINCT SUMATRIAN TIGERS ARE PROUDLY DISPLAYED AS STUFFED SPECIMENS IN LIVING ROOMS. BRAZIL AND PERU ARE MAJOR SOURCES OF SMUGGLED FURS OF RARE SPECIES OF OCELOT, JAGUAR AND THE GIANT OTTER. IN KENYA, TOURIST SHOPS OFFER LION-TOOTH NECKLACES, ELEPHANT-FOOT WASTEBASKETS, MONKEY-SKIN BLANKETS, GIRAFFE-HAIR BRACELETS AND GAZELLE-SKIN COATS.

THE RICH PAY HIGH PRICES FOR THESE TREASURES SO IT IS DIFFICULT TO CONTROL AND PREVENT SUCH ILLEGAL TRADE BETWEEN COUNTRIES.

IN KENYA, AFRICA, ILLEGAL HUNTERS OR POACHERS HUNT LEOPARDS AND ELEPHANTS. A 70 LB. IVORY TUSK CAN BRING THE HUNTERS $2,800 IN HONG KONG. THIS IS MORE THAN THE GAME WARDEN WILL FINE THEM IF THEY ARE CAUGHT POACHING.

IN CANADA'S GULF OF ST. LAWRENCE, HUNTERS SEARCH FOR NEWBORN SEALS IN THE EARLY SPRING. THE SLAUGHTER OF THESE YOUNG SEALS FOR FUR IS MOST DISTURBING.

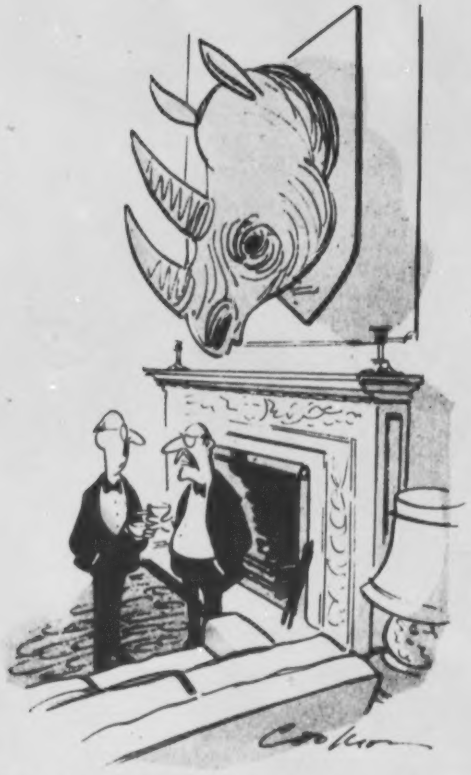
IN INDONESIA, HUNTERS KILL THE ENDANGERED ORANGUTAN BY SHOOTING THE MOTHER HIDING IN THE TREES. THE YOUNG ARE CAUGHT AS THEY FALL FROM THE TREES.

AT INTERNATIONAL AIRPORTS A NUMBER OF RARE AND ENDANGERED SPECIES ARE SHIPPED TO FAR AWAY PLACES. OFTEN THESE WILD CREATURES ARE FOUND SUFFOCATED IN CAGES, NEVER REACHING PET SHOPS OR ZOOS.

IN HONG KONG THE RICH BUY RARE, ENDANGERED SPECIES OF WILDLIFE. THE CRAB EATING MONGOOSE, RIVER OTTER AND BARKING DEER ARE SUPPLIED BY IN DEALERS IN CHINA FOR GOURMET FEASTS.

STUDENT WORKSHEET

1. PEOPLE → JUNGLE CATS → RATS
2. PEOPLE → CROCODILE → WILD DOGS / SNAKES / WILD PIGS
3. PEOPLE → ALLIGATOR → FISH
4. PEOPLE → HIPPO → ALGAE → FISH



By permission of PUNCH

Conservation News 12-15-

"Had to bag one, Harry—in case this damned Conservation thing doesn't work and they become extinct."

History of Nabonga

Curriculum Topic

AGE OF EXPLORATION
LANGUAGE ARTS
BIOLOGY

Environmental Topic

ENVIRONMENTAL POLICY

Skills

Evaluating information, defining problems, identifying alternatives, recognizing problems, analyzing information

Subject

Language Arts, Social Studies
Science

Grade Level(s)

5

Site

Classroom

Author

Karen Hayward

Objective

The student will be able to:

1. recognize an environmental problem,
2. identify the specific needs of organisms,
3. discuss critically the impacts of humans on an ecosystem.

Before You Begin

An ecosystem is a composite of parts functioning and reacting on and with each other. What one part of an ecosystem does affects all the other parts. People cannot remove or alter any part of an ecosystem without impacting the entire system. Human impact will depend on the actual magnitude of this action, the stability of the existing ecosystem, as well as, many other complex variables. The natural ecosystems that we encounter have cycles and through these an overall balance is maintained. Often we enter on the up swing of a cycle, are horrified at how a component is out of control, and attempt to "fix" the situation. In actuality, humans disrupt a cycle and impact the entire system.

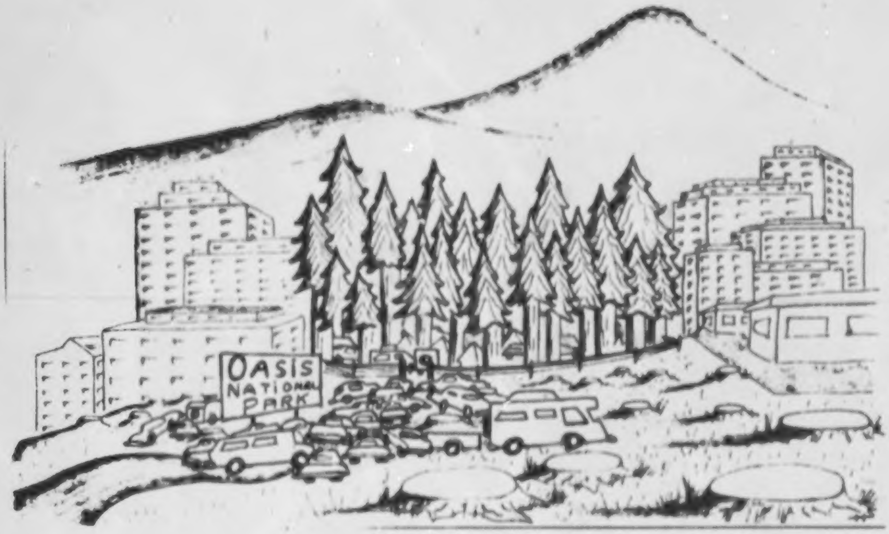
The situation presented to the students in the story of Nabonga somewhat parallels what occurred in Bermuda. The inhabitants disrupted the ecosystem's natural checks and balances. What resulted was a confusing mess.

Before You Begin

Materials: 2 sizes and colors of index cards, two colors yarn, pins, bulletin board, copies of Student Page.

Words To Know

imported, native, predator, food web



SEE BEGINNING OF ACTIVITY ON NEXT PAGE.

7. Discussion Questions:
   - a. What events caused the greatest damage? How could these have been avoided?
   - b. Do events affect more than one organism? Cite examples.
   - c. Where did the Nabongians go wrong?

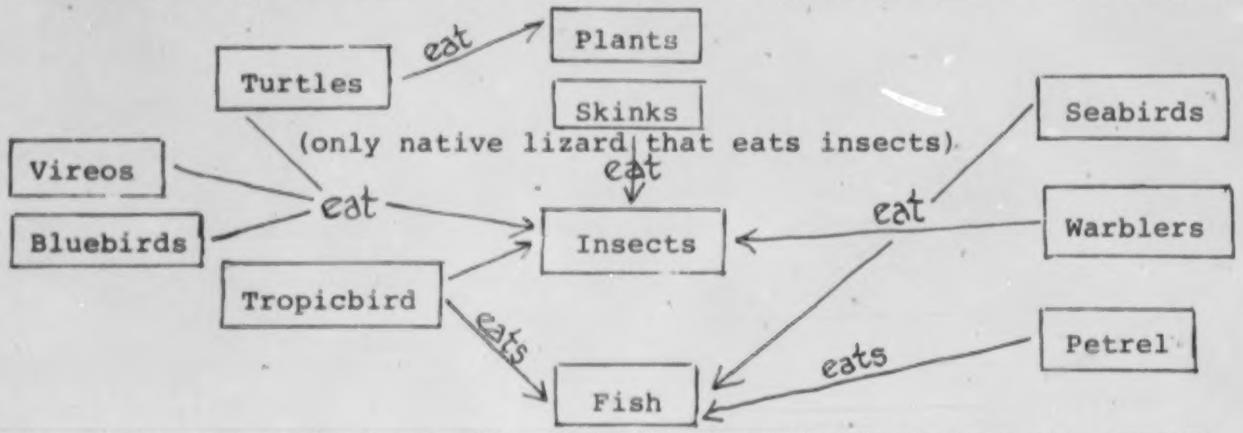
ACTIVITY

1. Have the class read the story found on the attached Student Page.

2. Discuss the story with the class. Make sure they understand the events in the story.

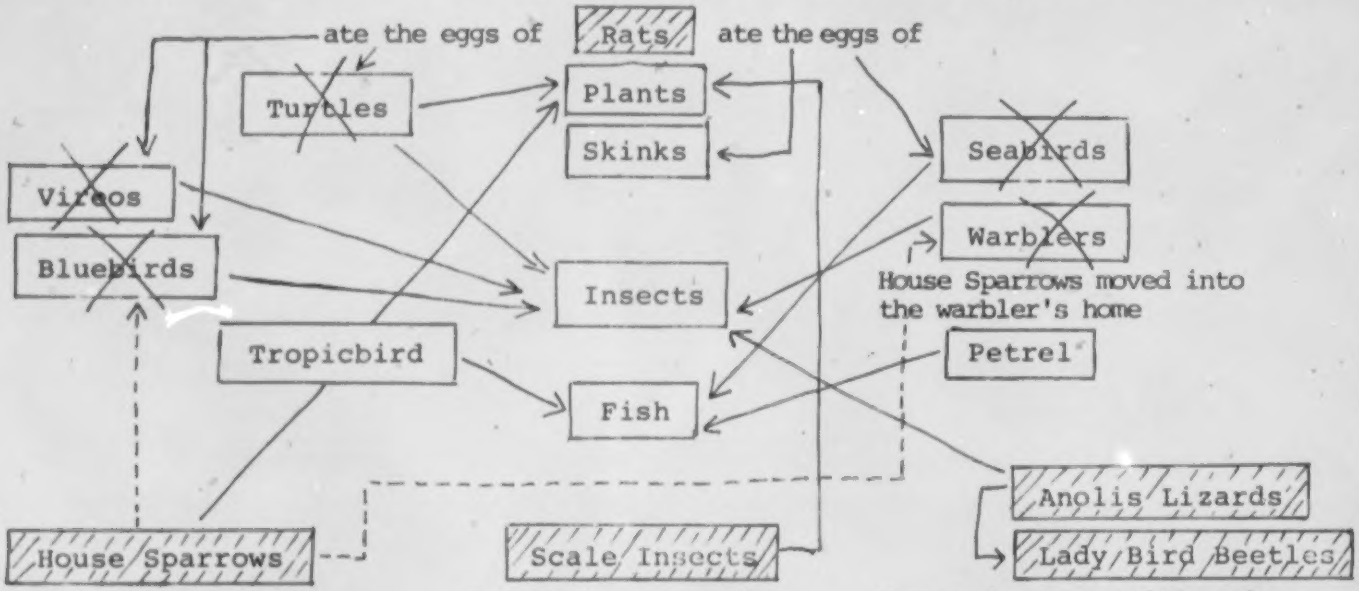
3. Have the class write the name of each organism in the Nabonga food web on a separate small index card. (3 x 5)

4. Assemble the cards on a bulletin board. Place pieces of yarn between organisms (plant or animal) to indicate connections on the food web as Nabonga existed before the first settlers arrived. Don't be afraid to have several pieces of yarn go to or from a single organism. An example of the food web for Nabonga is provided below. Be sure to spread cards out so there is adequate room between cards.


Turtles
eat
Plants
Skinks
(only native lizard that eats insects)
eat
Seabirds
Vireos
Bluebirds
eat
Insects
eat
Warblers
Tropicbird
eats
Petrel
eats
Fish

5. Have the students modify their food web by including the events that occurred after 1620. Write the event on a large colored index card. (5 x 8) Place card on bulletin board half way between organisms that are affected.

6. Have students explain the impacts of these events. It is a good idea to write the description of impact on event card. An example of the Nabonga Island Food Web (with people & friends) is provided below.


ate the eggs of
Rats
ate the eggs of
Turtles
Plants
Skinks
Seabirds
Vireos
Warblers
Bluebirds
Insects
House Sparrows moved into the warbler's home
Tropicbird
Petrel
Fish
Anolis Lizards
House Sparrows
Scale Insects
Lady Bird Beetles

Insects have very few predators now

Imported bugs to kill scale insects but all got eaten by anolis lizard

STUDENT PAGE

HISTORY OF NABONGA

In 1620, a ship called The Devestator landed with settlers on a tropical island about 600 miles east from the Kings Separate Colonies. These settlers were the first people ever to land on this coral island so they named it Nabonga and they became the Nabongians. Nabonga was a paradise with tropical birds, fruit, turtles, skinks and the most beautiful Puka trees anyone had ever seen.

On the island there was an abundance of insects but this was OK because the warblers, vireos, bluebirds, skinks, turtles and the tropicbird all ate insects. The turtles liked plants and the tropicbird sometimes consumed small fish. Everyone was happy.

The settlers had brought with them cats, dogs, horses, cattle, chickens, and mistakenly as stowaways rats, mice, and houseflies. For the first few years everything was wonderful. The people, cats dogs, rats and mice feasted on the island birds, turtles and skinks (the only lizard found on the island). Soon there were no more turtles or skinks and only a few island birds left. With the decrease of birds and skinks the insects that the birds and skinks once ate were free to multiply and grow with no fear of being eaten. This annoyed the people terribly because the houseflies were everywhere. So the Nagongians had an island meeting. At the meeting the people decided that they had two basic problems:

1. too many houseflies
2. not enough familiar birds

The Nabongians could not use poison to kill the insects because their only source of water was rain water which they caught running off of their roofs. So, the Nabongians sent one representative back to their homeland on the Devestator to capture a familiar bird who might eat insects. Several months later their representative returned with a flock fo House Sparrows. The Nabongians released them hoping to solve their problems. Well, it turned out that the House Sparrows were seed eaters not insect eaters. But the real problem was that the House Sparrows moved into the homes of the island's native birds. Warblers and Bluebirds (who by the way were insect eaters) and caused them to move to another island or die. So, now due to the fact that the seed eaters caused the insect eaters to leave there were many, many more houseflies.

Another island meeting was held. All the Nabongians complained about the insect problem. The Mayor of Nabonga stated that the House Sparrows were making the problem worse and that he wished that the House Sparrows never were brought to the island. One of the citizens suggested that they try lizards this time. So, they sent him as a representative to visit the neighboring islands to collect lizards which would be released on their Nabonga. The representative brought back a group of lizards that did in fact eat insects, but they also changed the area in which they lived. All went well for the next few years and it looked like the islanders might have finally solved their problem.

Then hidden in some trees brought from the King's Separate Islands were a group of tiny, hungry scale insects. These scale insect's favorite food was Puka trees. If you remember the insect eating birds and native skinks were gone and the imported lizards are not really interested in these types of insects because they are so small. The insects began to eat and eat and eat all the Puka trees.

It was then that the Nabongians began to realize that they needed to understand very detail of the food web. They had never really studied the links between the insects and all the other island inhabitants. So they wanted now to try to find some sort of predator of this scale insect that was its native enemy back on the King's Separate Colonies, where the scale insect came from. The islanders heard of a beetle in the King's Separate Colony who would eat these tiny scale insects, so again they met, selected a representative to capture the beetles in the King's Separate Colonies and then release them in Nabonga. Things looked good, only the islanders forgot about the lizards that they had imported a long time ago, before they were concerned about the food web links. The lizards ate all the beetles before the beetles could eat any of the tiny Puka tree eating scale insects. The Puka trees were lost. The wind which once could not blow across the island because it was stopped by the Puka trees now rips across. The island is a harsh and ugly place to live today.

Making Decisions Through Talking Animals

Curriculum Topic

COLONIAL PERIOD

Environmental Topic

ENVIRONMENTAL POLICY

Skills

Locating and obtaining information, evaluating information

Subject

Social Studies

Grade Level(s)

3 - 5

Site

Classroom

Author

Arthur C. Braun, Jr.
Antoinette R. Giovannitti

Objective

The student will be able to:

1. express, through role playing, his feelings and attitudes about the way early colonists influenced animal life, wooded areas and bodies of water.

To The Teacher

Since the early colonists came to America, the development and clearing of land areas has affected the existence of many forms of life which inhabit those areas.

Many forest animals were forced to re-locate their homes when the colonists utilized forest products to build towns. The colonist's arrival required the necessity of houses, stores, and churches. Fields were cleared to develop farms. Wooded land was cleared not only to use for housing, but also for fuel to heat their homes, common house, and church, and to cook their food.

The woodland creatures were disturbed and their tranquility was disrupted. Some ponds became laundry areas for women washing their clothes and utensils, as well as a place for people to bathe. Some water areas were dammed to collect large amounts of water for the irrigation of crops. Water was also diverted to locations faced with limited or no water supplies for drinking. And sometimes the careless use of fire was responsible for devastating the natural environment.

This activity will present a situation in which students will be able to role play the character of an animal who has had his home disrupted and his lifestyle changed. Be sure to discuss in detail any situation the student may encounter by providing them with background information.

Before You Begin

Materials: old (but clean) socks, buttons, felt pieces, cotton, odds and ends, needles and thread, very large box, paint, glue, twigs, clay, string, cardboard, and construction paper.

Words To Know

sewage, felling (cut down) trees, habitat, demonstration, situation, characters, alteration, environment, stripped, shelter disruption

Conservation News

ACTIVITY

1. Discuss and list with the students the animals that lived in the Northeastern woodland area during Colonial days. (Students should realize these are the same animals that presently live in this area, but not necessarily in the same exact location.) Discuss reasons for the altered habitat.

2. Announce that the students are going to make puppets and they may select from the list any animal (puppet) they would like to make. (Examples: chipmunk, squirrel, rabbit, beaver, bird (any kind), fish frog, man, etc.)

3. Give a short demonstration on how to thread a needle, knot the thread, sew on the necessary pieces and identifying characteristics that will depict the characters. For example, a rabbit has long pointed ears, squirrel has a bushy tail, etc.

4. Have a group of 2-3 students volunteer to make the stage. (These children may make a puppet at a later date, or those who finish first may be selected to make the stage.)

5. The stage can be a large box with the front and back removed. Paint the sides, top, and bottom with an outdoor scene. With paper, clay, twigs, string, sponge, and glue create some trees and shrubs. A curtain can close the back of the box so that the performers can conceal themselves except for their hands which will support the hand puppets.

6. The children will then be given a situation involving a change which disrupted the environment during colonial times. They should select the puppet characters needed for that particular situation.

Situation	Characters
a) The colonists are using the water for cleaning utensils, washing their clothes, and bathing their bodies.	man, fish, frogs, beaver
b) The Colonists stripped the wooded areas of trees to construct houses, build a mill and cloth factory for their town.	man, birds, squirrels, deer, chipmunks, rabbits, beaver
c) Roger Sherman has cleared large areas of wooded land to use for farms and to graze sheep.	man, deer, spiders, birds, squirrels, etc.
d) Roger Williams has dammed off water areas for water use.	
e) The Samual "Slater" factory has just been completed and is now dumping waste into the river.	
f) Eli Whitney's "mass production" factory is cutting down the forest for producing more guns, more fuel, and is polluting the air.	

g) A "fabric mill" has opened near the town's main water supply for drinking	man vs. man

7. Discussion questions:

a. When a change took place in one of our situations (name a specific play) who was affected by it? Were all our characters helped by the change? Who was helped and who was not helped?

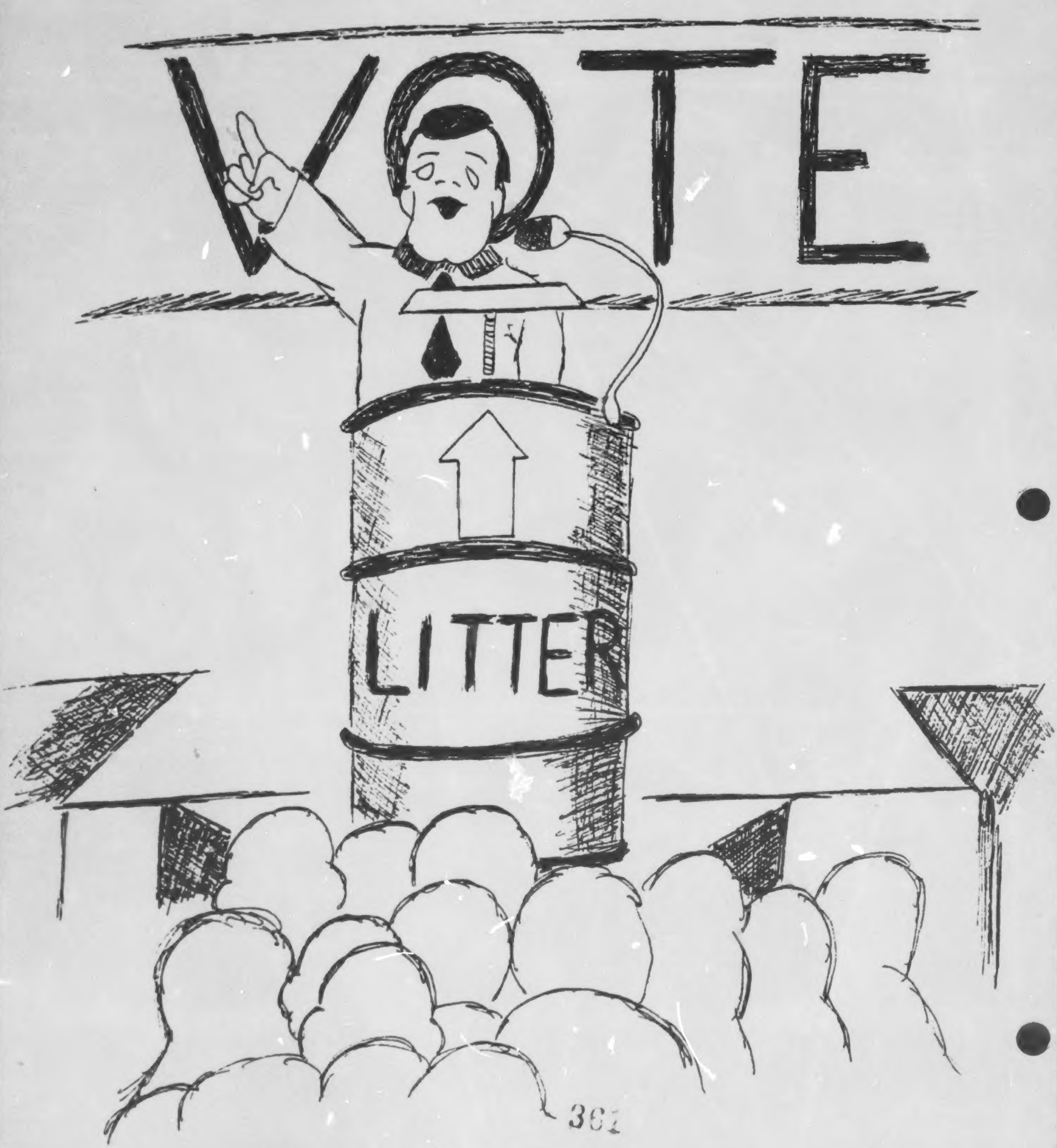
b. Is it possible to make changes in the environment and make everyone happy?

c. How can man continue to dispose of his waste (from the situations in the above activities: factory waste/domestic polluting) with the least amount of disruption to his environment?

Credit

Masouredis, Marilyn, "Animals, Puppets, People and Rights" from Stapp and Cox, Environmental Education Activities Manual, 1975 p. 57.

Notes To Myself


VOTE
LITTER

ENVIRONMENTAL ETHICS

RECYCLING
CENTER

ENVIRONMENTAL ETHICS

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ENVIRONMENTAL ETHICS

"It is essential for effective citizen participation that there be an understanding of the prevalent moral attitudes, principles and values (i.e. ethics) that shape environmental policy. To create this understanding, we can examine the development of prevalent worldviews as a basis for policy evaluation. A worldview exemplifies one set of ethics, based upon a set of beliefs about the basic nature of humanity, nature, and the universe: what we assume to be true, and what we hope or think will become true.

For some two hundred years, the industrial worldview has dominated and shaped major goals, priorities, and social structures throughout the Western world. Recently, many observers and analysts of societal and cultural developments have interpreted the present period of rapid change as constituting a major break with past standards, perceptions, and assumptions about the nature of the world and humanity. In other words, we are currently undergoing a shift in worldview. As such, a change of this magnitude will have a fundamental effect on social, political, economic and technological interrelationships, and will have direct implications for energy and environmental policy and practices at the individual and aggregate levels."

What does this shift in worldview mean to educators? It means preparing students for a new world.

Environmental concern will be short-lived if we do not deal with the attitudes and values that have led to environmental deterioration. An environmental ethic is a disposition in a person's life that allows them to act according to the values they cherish. That requires both an awareness and a reevaluation of beliefs and actions that the conflicts can be resolved.

Environmental education can expose students to pollution. It can demonstrate that population x per capita consumption x environmental impact = ecosystem disruption and pollution. It can even cause students to recognize that the world is finite and that life-support systems as we know them are vulnerable. But unless we move students to an ethic of creative earth stewardship, their worldview has not been changed.

This environmental ethic balances resource use with preservation and avoids both the tyranny of survival and the tryanny of individualism. Its goals can best be summarized in a set of new ethical guidelines:

1. Man is not the source of all value.
2. Man must be the wise caretaker and steward of the earth for present and future generations.
3. Man's primary purpose is not to produce and consume but to conserve and renew, replenish not ravage the earth.
4. Improvement of life quality, not ever-increasing production and consumption of material things, must be our goal.
5. Earth resources are finite and must be cherished and renewed, not wasted.

6. Man's relationship to nature must be that of man and nature, a symbiotic partnership based on ecological understanding and cooperation.
7. Man is to preserve stability and enhance life quality by preserving and encouraging physical, biological, and cultural diversity.
8. A major function of the state is to supervise long range planning and to prevent individuals and corporations from exploiting or imparing the quality of the environment and human freedom and dignity.
9. Because no one can or should exclusively do his or her own thing, the ideal human goal is that of sharing and caring, not complete individualism and domination.
10. Each human being on this planet is unique, unprecedented, and has a right to a basic share of the ecosphere's resources.
11. No individual, corporation, or nation has a right to an ever-increasing share of the earth's finite resources.[2]

---

[1] High School Energy/Environmental Education Teacher Training Model: Content Sourcebook prepared by Far West Laboratory for Educational Research and Development, 1978 (Draft Version).

[2] G. T. Miller, Jr., Living in the Environment-Concepts, Problems and Alternatives, 1975, Wadsworth Publishing Co., California -. 365.

Is the Moped a Status Symbol of the Future?

Curriculum Topic

THE FUTURE

Environmental Topic

ENVIRONMENTAL ETHICS

Skills

Recognizing problems, generating alternate solutions, brainstorming

Subject

Social Studies

Grade Level(s)

Adaptable

Site

Classroom

Author

Cyndi Walsh

Objective

The student will be able to:

1. distinguish between wants and needs.
2. list the ways advertising media appeals to the public.
3. evaluate the role of adverising in poor environmental management.
4. assess the role of advertising in building proper environmental ethics.

To The Teacher

In the United States at this time there is a great concern for the development of consumer education programs. Necessary critical thinking skills are essential to effective functioning as consumers and citizens. This activity will give students an opportunity to interact positively with their environment, and encourage students to see themselves as responsible critical consumers. The typical TV target audience is between 2 and 11 years old and watches over 20,000 commercials in a year. Students need to be discerning. Current proposals from the Federal Trade Commission entertain the idea of a ban on commercials directed at children under 8 with a penality of corrective advertising to give the balanced information. Consumer education is becoming a government priority!

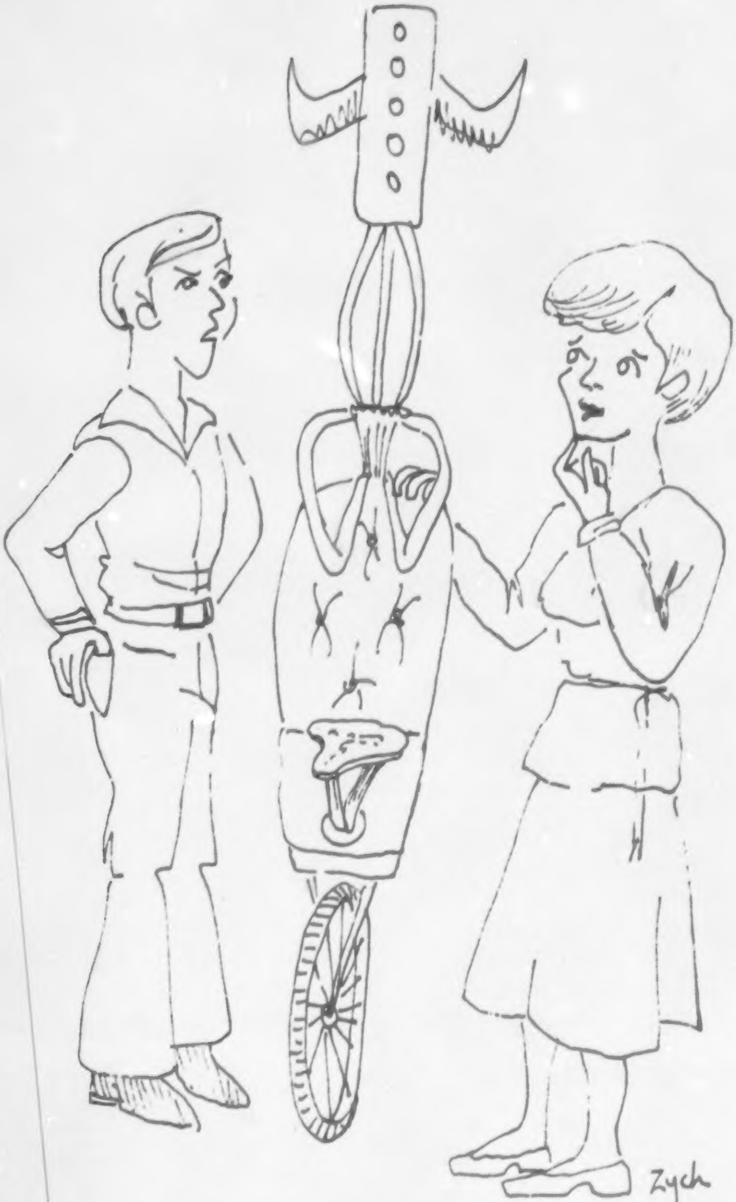
Before You Begin

Materials: advertisements from all sorts of media, magazines, newspapers, taped radio and TV commercials.

Words To Know

advertising, status, deception

"I don't care what the ad said, I'm not going to wear it!"



ACTIVITY

Part I

1. Ask students to bring to class adverisements or a description of commercials of products they may want or need in a year's time. (Album ad from newspaper, TV commercial for ten-speed bike, etc.)

2. Place all advertisements together and ask students to separate needs from wants. (essential from non-essential)

3. Discuss what internal and external factors make it difficult to make this judgment.

4. How does advertising influence this judgment?

5. Ask students to write down their last purchase and why they bought it.

   a. Did an advertisement cause the desire to own the item or did they want it first and then seek out advertisement for information?

   b. Were they happy with their purchase? Did it live up to the expectations? Was the advertisement accurate?

6. Develop a list of ways in which advertising convinces the consumer that wants are needs. Such as: it appeals to - emotion, logic sense of humor. (Other categories will grow from analysis of ads.)

7. Ask students to categorize the ads they brought to class based on the list. Examples:

   a. Find a family ad that shows a happy family using the product. (emotional)

   b. Find a romantic advertisement that insure popularity. (emotional)

   c. Find a humorous ad with a catchy jingle or phrase. (humorous)

8. Ask students to brainstorm other categories and types of appeals. This part of the activity will insure a critical evaluation of the media.

Part II

1. Group students to brainstorm ways in which the advertising industry might act more constructively in terms of our world problems.

2. Challenge students to find examples of advertisements that promote energy conservation, recycling, etc. (These may be found in business magazines such as Forbes.)

3. How does advertising use peer pressure and status seeking to in inspire countless energy using activities and waste. Can it be used to make energy saving and recycling a status symbol of the future?

4. Ask students to envision a time when they may be resentful of an energy wasteful consumer. A flashy car dragster racing up to a gas pump threatens our fuel supply whereas the conservative moped owner might be praised as an American hero.

5. Ask students to brainstorm ways to play up energy saving and recycling (e.g. encourage non-polluting cleaners. Using advertisement methods, develop environmental ads that encouarge a purchase of a product because it is not harmful to the environment. Turn a patriotic casue into a status symbol.)

6. Put your campaign into action using tapes posters, etc. Share your ideas with other class members.

Related Activities

1. Debate the following issue:

> The staff of the Federal Trade Commission has sent forward proposals to:
>
> a. ban any advertising to kids under 8.
>
> b. eliminate advertising of highly sugared products to kids between the ages of 8 and 12.
>
> c. force advertisers of other sugared foods to pay for corrective advertising to give kids balanced information.
>
> Side I: Many people believe that there is sufficient evidence of deception and unfairness in children's advertising to warrant a rule-making proceding.
>
> Side II: Advertising business people believe that a ban on advertising will not change children's wants and needs. The ban on cigarette smoking did not influence people to quit smoking.
>
> Ask your class to compromise this dilemma.

2. Have your class create a new product that is environmentally sound. Design a container. Develop a radio and TV campaign to promote this new creation.

3. Write to companies asking them to substantiate their claims in their advertising.

Resources

Advertising Age, February 27, 1978 pp. 51-52.

"Argument Over Advertising to Children", Media Decisions, May, 1978 p. 61 ff.

Credit

Drawing: Cecelia Zych

Endangered Species — Native Americans

Curriculum Topic

INDIANS
LETTER WRITING

Environmental Topic

ENVIRONMENTAL ETHICS

Skills

Problem solving

Subject

Social Studies

Grade Level(s)

3 - 5

Site

Classroom

Author

Cyndi Walsh

Objective

The student will be able to identify reasons for broken treaties and bad relations between the United States government and the American Indian.

To The Teacher

This activity gives the student an opportunity to see how the need for natural resources has led to social injustices to the American Indian throughout history.

After a discussion of treaty agreements and forced Indian migration, students will assume the role of an Indian child in a letter writing assignment.

Before You Begin

Materials: library and reference books on Indian history; pencil, paper, copies of the student page

Words To Know

treaty, prospectors, uranium

ACTIVITY

1. Ask students to bring to class books and magazine articles concerning Indian history.

2. Chronologically list and discuss events of Indian history especially noting causes of battles and the resultant treaties.

3. Students will then read the student information sheet and follow the directions, working in small groups or individually.

Related Activities

For more sophisticated groups:

1. Ask the students to play the role of the President and answer the letter to the Indian child.

2. Have the students write a Reservation Land management law that would help the energy crisis and show fairness to the Indian.

Resources

Kontos, P.G., The United States Before 1900, Cambridge Book Company, 1975, pp. 205-208

Kontos, P.G., The United States in the Twentieth Century, Cambridge Book Company, 1975, p. 211

Newsweek, U.S. News, and National Geographic magazines: Indexes will provide a rich resource for current events on today's Indian.

The United States: Windows on the World, Houghton-Mifflin Company, Boston, 1976, pp. 304-306, 208-211, 277-285

Notes To Myself

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STUDENT PAGE

The Indians, our Native Americans, have had a history of mixed feelings about the white man who settled in America. At first, they feared the new settlers but learned to live with their white brothers by sharing secrets of the land. As the number of Colonial settlers grew, so did their need for good farmland. As more and more land was farmed, good hunting grounds were taken from the Indians until little good land remained.

In the 1830's, gold was discovered on the homeland of the Cherokee Indians. The United States government forced the Cherokee people to sign a treaty agreement to trade this land for distant territories. Other tribes had similar agreements. Many times the Indians did not want to trade their land but the government was too powerful to fight.

In 1867, Congress reserved special areas for Indian tribes called reservations. Supported by the government, the Indians received everything they needed if they remained on that special piece of land. But on the reservation, the Indian's home was not safe from the white man's needs.

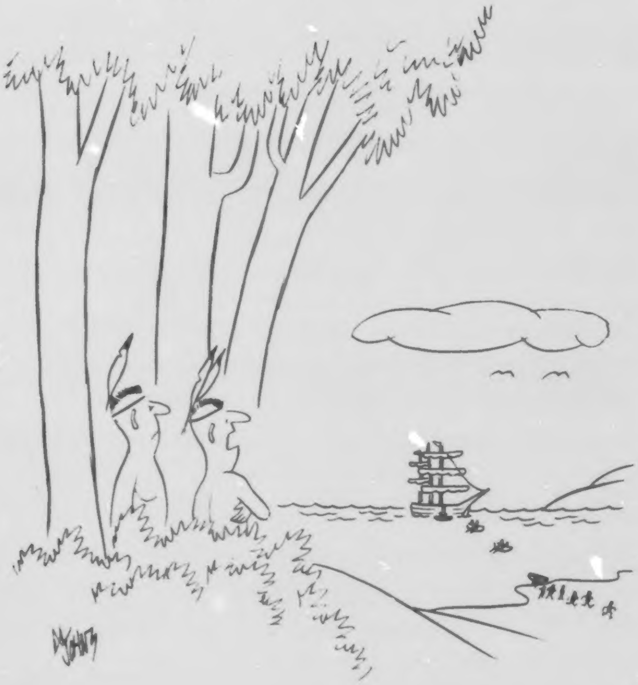
In 1875, gold was again discovered on the reservation. Many gold prospectors wanted this mineral-rich land, which angered the Indian chiefs. Chiefs Sitting Bull, Crazy Horse, Geronimo and others decided to lead their people to war. Many were killed. At the battle of Wounded Knee the last Indians surrendered to the government. The Indians were then forced to live on the most undesirable farm land.

Since then some tribes of Indians have lived unhappily, but peacefully, on the reservations. Others have moved to cities. But today they still fear the white man's need for progress. The Indians feel that the energy crisis will bring mining companies to their land because oil and uranium have been found on their reservations.

STUDENT PAGE

DIRECTIONS: AFTER READING THE INFORMATION ON THE AMERICAN INDIAN, ANSWER THE FOLLOWING QUESTIONS.

1. Should the United States government ask the Indians to give up their homes?
2. What would be the consequences to the Indian people if they are asked to give up their land and live in cities and suburbs?
3. Pretend you are an Indian. Write a letter to the President of the United States asking him not to change the present treaties that protect your land.



"AW, LET 'EM STAY... WHAT POSSIBLE HARM CAN THEY DO?"

Conservation News 11-1-76

Activities I Like to Do and Their Implication

Curriculum Topic

CITIZENSHIP - the responsibility of citizens to the environment.

Environmental Topic

ENVIRONMENTAL ETHICS -We often fail to distinguish between essential needs and nonessential desires.

Skills

Analyzing & recognizing problems
Generating alternative solutions
Identifying values & consequences

Subject

Science
Social Studies

Grade Level(s)

3 - 5

Site

Classroom

Author

Thomas Kotulski*

Objective

The student will be able to distinguish between essential and non-essential, and between needs and desires by participation in a values-clarification activity involving the issue of environmental ethics.

To The Teacher

Value clarification activities provide a means for perceiving the assumptions which motivate desires. In this activity, the recognition of such behavioral assumptions by students will enable them to consider the impact each has upon the quality of the environment. It is hoped that by knowing the number and nature of demands they place upon the environment, students will be made aware of what they must do to become stewards of the earth.

Before You Begin

MATERIALS: paper, pens, pencils, blackboard (optional)

CAUTION: Inform students that they are not to talk during the first step in this activity.

Words To Know

needs, essential, wants, desires, nonessential, value, pollute, energy

ACTIVITY

1. Pass out paper which students divide into four equally-spaced vertical columns. In the first column, each student is to list "Twenty Things I Like to Do". (10 - 15 minutes)

2. Head remaining columns: "Requiring Energy Resources", "Pollutes Environment", "Requires a Particular Environment" (i.e., bird-watching requires birds, baseball requires large area of open land).

If an activity from the 20 in List 1 fits under any of these headings, the student is to place a check in the appropriate place (10-20 min).

3. Discussion:

a. How many students have a large number of activities which (as their checks indicate) require energy?

b. What do your answers to question a imply about your expectations of the environment as a supplier of energy?

c. Can the environment supply this amount and type of energy to everyone forever? Why/why not?

d. How many students in the class have enjoyments which cause pollution? (List these on the blackboard).

e. Are any of these activities essential to your life? Which activities requiring energy are essential? Can any of these be eliminated?

f. Which activities from your list of "Twenty Things I Like to Do?" might/would you eliminate? Why?

Related Activities

Ask students to interview parents, grandparents or other older people who will offer them a list of "Twenty Things I Like to Do" with which to compare the student's own list already drawn-up in class. Assign a page or short paper in which students will describe comparisons and contrasts between the two lists of "Twenty Things I Like to Do."

Resources

Simon, S. et. al., Values Clarification, Hart Publishing Co., 1971

Credit

*Pat Marshall, contributor

Notes To Myself

Mess'in with Math

Curriculum Topic

MATH - a. adding/multiplication
  b. spatial relationships
CITIZENSHIP
URBAN STUDIES

Environmental Topic

ENVIRONMENTAL ETHICS
ENVIRONMENTAL QUALITY

Skills

Computing, recognizing problems, generating alternate solutions, measuring

Subject

Math/Social Studies

Grade Level(s)

3

Site

Classroom

Author

Arthur C. Braun, Jr.

Antoinette R. Giovannitti

Objective

The student will be able to:

1. mathematically substantiate the reason for preparing cans in a crushed state before bringing to a recycling center.

To The Teacher

Through this activity the student will review the skills of regrouping in addition, subtraction and multiplication. They will also be made aware of the fact that mathematical principles can be applied to solve daily problems. The basic principle to be gleaned from the activity is that aluminum cans do not in all practical terms, decompose and thus should be crushed and prepared for recycling centers.

Disposing of waste is a problem. Disposal is often accomplished by means that increases air and water pollution. Waste is burned, and the smoke pollutes the air. Or it is dumped directly or indirectly into the sea, and the water is polluted. Two conditions make this a bigger problem than ever before: 1.) over population and, 2.) overconsumption.

Fancy, eye-catching packages are big offenders. Often a product the size of a nail brush will be encased in a foot of cardboard and cellophane. Many natural systems are disturbed and much energy required to provide a nail brush with a pink and orange display box.

37C

There are ways to oppose excess packaging and waste. Buy items in containers that decompose readily - aluminum and plastic do not, pasteboard, cardboard and paper are better. Buy returnable bottles instead of indestructible aluminum cans. Tin cans at least rust. Collect and return all returnable bottles. Avoid stores that have a policy of selling non-returnables. Some aluminum companies have established reclamation centers for their used cans. Collect aluminum cans and return them. The company usually pays about ten cents per pound (there are about twenty twelve-ounce beverage cans in a pound). Take metal hangers back to the cleaners. Refuse the plastic shrouds cleaners put over clothes. Return junk mail to the sender in his own prepared envelope, without ordering the product. Save, wash and reuse plastic bags. Also when buying something small refuse the bag. And when shopping for more than a single item, consolidate your purchases into one bag - maybe even a net bag you've brought along yourself. The total life cycle of any purchase must be considered to avoid our waste disposal problems.

Before You Begin

Materials: Small medium-sized cardboard box, soda cans (from home) pencil, paper.

Preparation: Have students save soda cans at home for about one week.

Caution: Take safety precautions when children crush cans. (If they bend them excessively, they could get cut.)

Words To Know

recycle, crushed, decompose, aluminum, plastic bags, space

Notes To Myself

ACTIVITY

1. Discuss the need to recycle waste materials. (See To The Teacher for specific discussion information).

2. Discuss the fact that there are special ways to prepare materials for recycling centers. Newspapers are tied in bundles. Glass is separated according to color. Cans, too, have to be prepared.

3. Encourage students to use their math skills to find out the most efficient way to recycle cans.

4. Have students fill a carton with empty, uncrushed soda cans.

5. Count the number of cans it took to fill the carton. Ask if they can think of a way to get more cans into the carton? (crush them)

6. Empty the carton and crush each can. Now refill the carton with crushed cans.

7. Ask the students if the space in the box has changed? Why does there seem to be more room? Add more crushed cans to fill the box.

8. Count the number of crushed cans it took to fill the carton.

9. Discussion Questions:

   a. How will crushing your soda cans help people at the recycling center store your cans?

   b. How will it save time and money for the truck drivers who bring the cans to the factory?

Related Activities

Expand the activity to compare the number of boxes necessary to store crushed and uncrushed soda cans from every classroom in the school. (Assume that each class would bring in the same number of cans.)

Resources

Gabel, Margaret, Sparrows Don't Drop Candy Wrappers, Dodd and Mead Inc., 1971.

Lipschitz, M., "The Math of the Mess", Eco-News: A Young People's Environmental Newsletter, March, 1974.

Credit

Antoinette R. Giovannitti, contributor

Use it Again

Curriculum Topic

CITIZENSHIP - Language Arts
(letter writing)

Environmental Topic

ENVIRONMENTAL ETHICS

Skills

Writing, locating and obtaining information, organizing information communicating information

Subject

Social Studies

Grade Level(s)

3 - 5

Site

Classroom

Author

Sandra Price

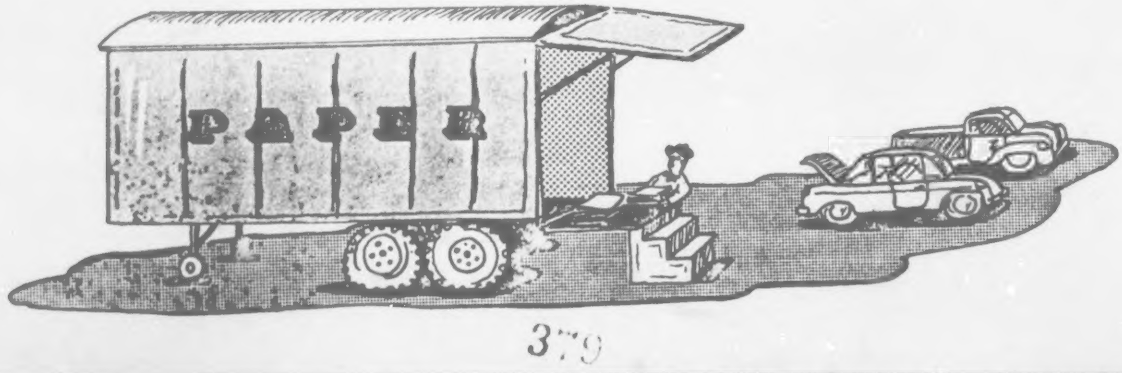
Objective

The student will be able to:

1. list the kinds of solid wastes that are recycled in their community
2. compose a letter in order to obtain more information on recycling

To The Teacher

When students study about their communities and states, they are made aware of our resources, the problems of our survival, and how we can work together to solve our problems. One situation that is immediately evident is our wasteful habit of consuming and throwing away. Fortunately, this is an area in which students can become knowledgeable and effective citizens. This lesson is one attempt at having students educate themselves and others in an aspect of good citizenship.



In our affluent, industrialized nation we have used more minerals and fossil fuels within the last 30 years than all countries of the world used since the beginning of history. (McKelvey 1972 from Miller). With only 6% of the world's population, the United States consumes about 1/3 of the world's resources.

"Each year our output (of solid waste) could cover the entire state of Connecticut one foot deep in trash." (Miller) based on present garbage output (about 5½ lbs./day per household,) it is estimated that by 1980 each household will throw away daily 8 lbs. of solid waste. (Pollution)

Eventually nature recycles most of what we throw away, but the solid wastes of today take longer to decompose than the solid wastes of past years. Aluminum cans require 500 years to become aluminum oxide dust; tin cans rust away in about 100 years. Plastic bags are degraded in about 250 years; paper bags, in a few years. Glass bottles are around forever (1,000,000 years to return to sand-sized particles.) (Miller)

There is a huge industry for mining and foresting. The industry for recovering and reusing resources is small. The mining and forestry industries get tax write-offs for depleted resources. Transportation rates for recycled materials are as much as 50% higher (federally controlled) than for virgin resources.

Recycling and reusing, although they require some energy, are much more efficient and less polluting than making everything new to throw away. For example, recycling a stack of newspapers 36 inches high into new paper saves a tree; recycled paper can also be used to insulate houses.

Citizens need to change their consumption, throw-away habits and bring pressure to bear on industry and government to do the same. We could refuse to buy aluminum cans, for example. We could work for legislation to tax over-packaged items. We could encourage people and communities to recycle paper, aluminum cans and glass.

This activity involves writing letters to find out more about recycling efforts and practices in the state. The activity fits in to a language arts unit on letter writing, style and format.

Before You Begin

paper-pencils, envelopes, stamps

Time required: 3-4 periods: discussion, writing letters, organizing information, giving reports

Caution: As a courtesy to public officials and companies, it is important not to have many children writing to the same source. Plan your class so that only one student or one group of students sends a letter to any single source.

Words To Know

recycling, resources, reuse, incentive

ACTIVITY

1. Review the rules for style and format of letter writing.

2. Discuss with students the necessity to recycle trash so that:

    a. the valuable resources can be reused and

    b. we do not pollute the air and use the land to get rid of our trash.

3. The students will write letters to gather information about recycling in their communities. The students may be divided into groups to write for information from a variety of sources. Some categories of information for which they might write would be:

A. Local recycling facility (call the Town Hall to get the name and address of the local recycling program.)

1. Where is it?
2. What hours is it open?
3. Is there any provision for neighborhood pick-ups?
4. Who does the work at the recycling center?
5. What kinds of solid wastes are collected there?
6. What happens to the materials after they are collected?
7. What condition do the solids have to be in, (i.e. bottles washed, glass separated by color, cans crushed.)
8. How do you identify specific kinds of materials that may be recycled, (i.e. aluminum cans have moulded bottoms and no side seam, polystyrene plastic has a shiny metallic appearance along the edge of a break)
9. What problems are there with operating the center?
10. How are people encouraged to participate?
11. What percentage of the people in the area use the recycling center?

B. Local Industries (compile a list of addresses of local industries)

1. Ask how they use or might use any recycled materials in their production.
2. Ask if they recycle any of their waste materials, (i.e. oil, office paper, metal scraps.)
3. Are there any reasons that discourage them from using recycled materials or recycling their own wastes, (i.e. freight costs, taxes.)

C. Area Recycling Plants (look in the yellow pages for recycling centers and dealers. There are listings for companies that specialize in buying and selling scrap metals and paper.)

1. Find out how they collect solid wastes.
2. Ask the money value for recycled materials.
3. Ask what these metals, paper, etc. are used for when they are recycled.
4. Find out how taxes and freight rates affect their business. Can they compete with industries that extract virgin resources?

D. State Agencies (write the state Department of Environmental Protection.)

1. Find out what the state is doing to encourage recycling.
2. What agencies give services to local communities?
3. What legislation is there on recycling?
4. Is there money available to help communities start and maintain recycling centers?

Discussion:

Each group of students will give a report on what they learned about recycling as it affects their community. Encourage a discussion on what incentives there are for individuals and industries to recycle and whether or not they think these incentives are sufficient encouragement to make recycling an accepted part of our lifestyle. What more do the children think could be done to promote recycling on the part of the local community residents, industries, legislators.

Related Activities

1. Invite someone from the local recycling center or environmental protection agency to talk with the students about recycling.

2. Visit the local recycling center.

Resources

Miller, G. Tyler, Jr., Living in the Environment: Concepts, Problems, and Alternatives, Wadsworth Publishing Co., Inc., EEC #B79.

Wentworth, Daniel F., Kenneth J. Couchman, John C. MacBean, Adam Stecher, Pollution: Examining Your Environment, Mine Publishers, Inc. 1971, EEC #B42.

"A New England Recycling Directory", United States Environmental Protection Agency, Region I, Boston, MA 1977.

Notes To Myself

Should Doughnuts be Allowed in School

Curriculum Topic

NUTRITION AND DRUGS

Environmental Topic

ENVIRONMENTAL ETHICS

Skills

Brainstorming, recognizing problems, generating alternate solutions

Subject

Social Studies

Grade Level(s)

Adaptable

Site

Classroom

Author

Cyndi Walsh

Objective

The student will be able to:

1. discuss the beneficial aspects of a nutritious, sensible breakfast for school age students.

2. demonstrate an awareness of the responsibility of citizens to develope and change policy that effects the well-being of all Americans.

To The Teacher

As future citizens, students of today will be faced with decisions that will have a direct impact on the quality of life. The following decision-making activity will give practice in such a process and will reinforce consideration of all consequences. This aspect of analysis is a vital part of decision-making for the citizen, consumer and voter. Presented in this activity is a very real priority concern for the government.

Background information on the use of the continuum, alternative search, and a consequence search used in this activity follows:

a. Continuum: the teacher and the students determine two polar positions on an issue. The positions are placed at the opposite ends of the line, and a series of points are marked along the continuum. The teacher asks the students to indicate their position on an issue, briefly describing their assessment and rationale. (This can be a written assignment.)

b. Alternative search: the teacher gives a value-laden problem such as the super doughnut story, and asks students to brainstorm alternatives. In small groups students combine answers add other solutions and decide on the top three solutions. These three solutions are then rank ordered.

c. Consequence search: after the three top solutions are chosen, each group member is asked to brainstorm resulting consequences of each answer. Groups report to the class.

All of these strategies are included in the following activity. The activity is self-directing and the teacher need only facilitate the grouping, allocate time and answer general questions.

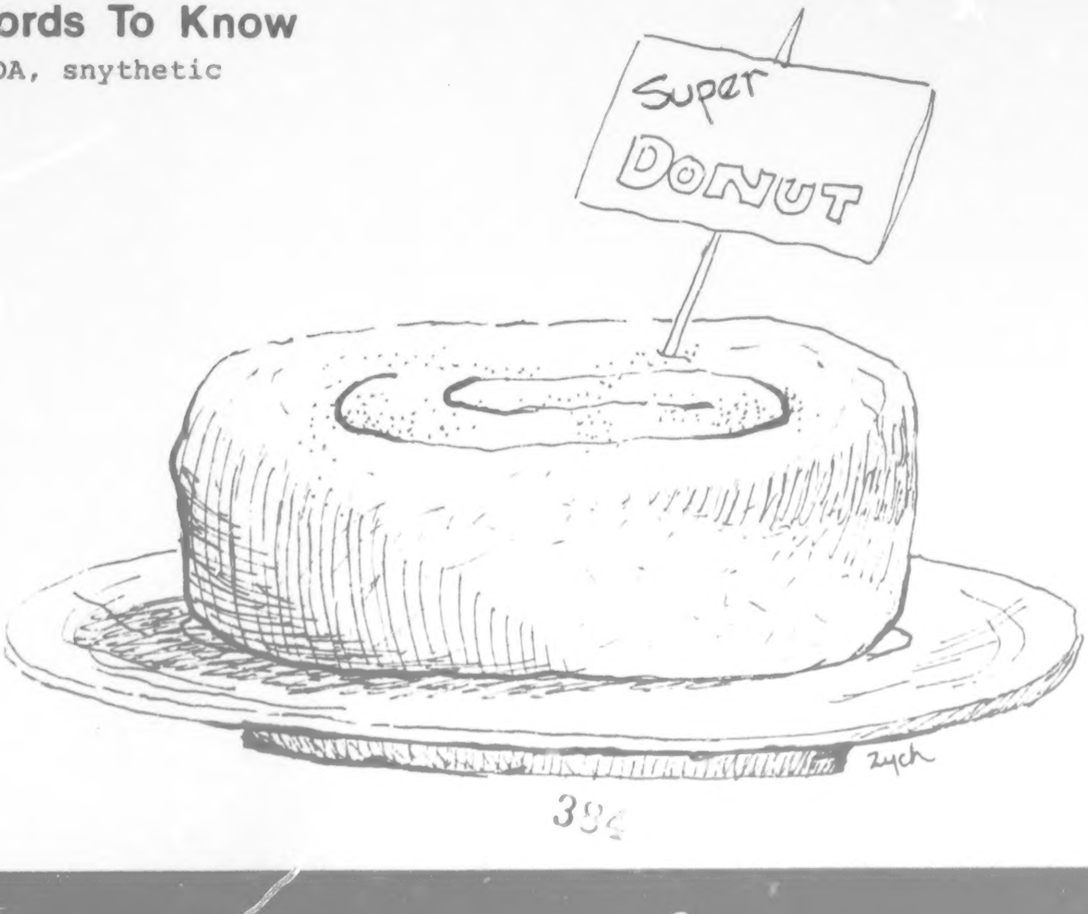
Before You Begin

Materials: Students will need pencils.

Preparation: Duplicate enough copies of the problem description and student direction page for entire class.

Words To Know

USDA, snythetic



ACTIVITY

1. Group students.
2. Pass out the problem description page.
3. Read problem orally.
4. Distribute direction page.
5. Instruct groups to follow the directions to solve the problem.
6. Debriefing session; Sharing of group's decisions.

Related Activities

1. Nutrition activities may be encouraged by the group interaction; breakfast checklist, cereal analysis for nutrition and cost per unit.
2. Write letters to the USDA concerning the proposed ban.
3. Research inner-city school breakfast policies.

Resources

"Does the USDA Have A Whole In the Head?", Vegetarian Times, April, 1978, p. 15.

Credit

Drawing: Cecelia Zych

Notes To Myself

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STUDENT PAGE

WHAT'S TO BE DONE?

ON ANY GIVEN DAY 203,000 SCHOOL CHILDREN WILL EAT A "SUPER DOUGHNUT" AND A GLASS OF MILK FOR BREAKFAST. THE SUPER DOUGHNUT IS REALLY A SWEETROLL MADE OF WHITE FLOUR, SUGAR, AND SHORTENING WITH AN EXTRA DOSE OF SYNTHETIC VITAMINS WHICH WILL PROVIDE ¼ OF THE CHILD'S RDA OF KNOWN VITAMINS. MOST SCHOOL SYSTEM'S PURCHASE THEM FROM WONDER-BREAD OR KEEBLER BAKERIES.

THESE BREAKFAST BARS OR FORMULATED GRAIN FRUIT PRODUCTS ARE A NEW PART OF THE FEDERAL SCHOOL BREAKFAST PROGRAM. SINCE THEIR INTRODUCTION IN 1973, THE BREAKFAST BARS HAVE BEEN UNDER ATTACK BY PARENTS, TEACHERS AND NUTRITIONISTS. RECENTLY, THE USDA HAS JOINED THE CRITICISM ARGUING THAT THE TREAT DOES NOT INSTILL GOOD EATING HABITS. IT IS EASY TO CONFUSE A SUPER DOUGHNUT WITH A PLAIN OLD SWEETROLL, WHICH IN FACT IS THE SAME WITH THE EXCEPTION OF A HANDFUL OF VITAMINS.

ELIMINATION OF THE BREAKFAST BAR PROGRAM HAS MET WITH RESISTENCE FROM THE PEOPLE WHO PRODUCE THEM AND STAND TO LOSE MONEY AND JOBS IF THE BAN IS ENACTED. SOME OF THE PEOPLE THAT WILL BE HURT FROM SUCH ACTION ARE THE INNER-CITY MINORITY GROUPS EMPLOYED BY THE BAKERIES. OTHER RESISTERS INSIST THAT THE CHILDREN WHO RECEIVE THE SUPER DOUGHNUT AND MILK FOR BREAKFAST WOULD OTHERWISE RECEIVE NOTHING AT ALL FOR BREAKFAST. THIS MEANS HUNDREDS OF THOUSANDS OF CHILDREN DAILY, A MAJORITY OF WHICH ARE INNER-CITY CHILDREN.

SCHOOLS WHICH PARTICIPATE IN THE BREAKFAST PROGRAMS ARE ENTITLED TO RECEIVE FEDERAL REIMBURSEMENT FOR THEIR MEALS PROVIDED THE MEALS MEET MINIMUM GUIDELINES. THE REQUIREMENTS ARE MILK, GRAIN, AND FRUIT. WHEN THE BREAKFAST BARS ARE SERVED WITH A CARTON OF MILK, THEY MEET THE FEDERAL REQUIREMENTS.

SHOULD THE SUPER DOUGHNUT BE BANNED?

DIRECTIONS

1. WORKING WITH A SMALL GROUP, BRAINSTORM A LIST OF EVERY ALTERNATIVE SOLUTION YOU CAN THINK OF.

2. WHERE DO YOU STAND ON THE CONTINUUM?

/_____/_____/_____/_____/_____/_____/_____/_____/_____/

ban the super doughnut	keep the super doughnut in school breakfasts

3. CONSEQUENCE SEARCH

AT THE TOP OF THE GRID, RANK THE THREE BEST SOLUTIONS THAT HAVE BEEN DEVELOPED BY YOUR GROUP. FOR EACH OF THESE THREE SOLUTIONS LIST ALL OF THE THINGS THAT MIGHT HAPPEN AS A RESULT OF YOUR DECISION.

SOLUTION #1

____

____

____

____

____

SOLUTION #2

____

____

____

____

____

SOLUTION #3

Super
DONUT
Zych

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Conservation Heroes

Curriculum Topic

CAREER AWARENESS

Environmental Topic

ECONOMICS, TECHNOLOGY & CULTURE

Skills

Locating and obtaining information, using information for a purpose

Subject

Social Studies

Grade Level(s)

3-8

Site

Classroom

Author

Cyndi Walsh

Objective

The student will be able to:

1. identify conservation heroes of the past and present.

To The Teacher

Surrounded by abundance, Americans began only slowly to realize the need for conservation. To most people, limiting the use of resources was contrary to the American way of life. However, concern for conservation began with the protests of a few scientists and writers. It was these protestors who realized what could happen in areas where population, urbanization, and industry were expanding without concern for environmental impact.

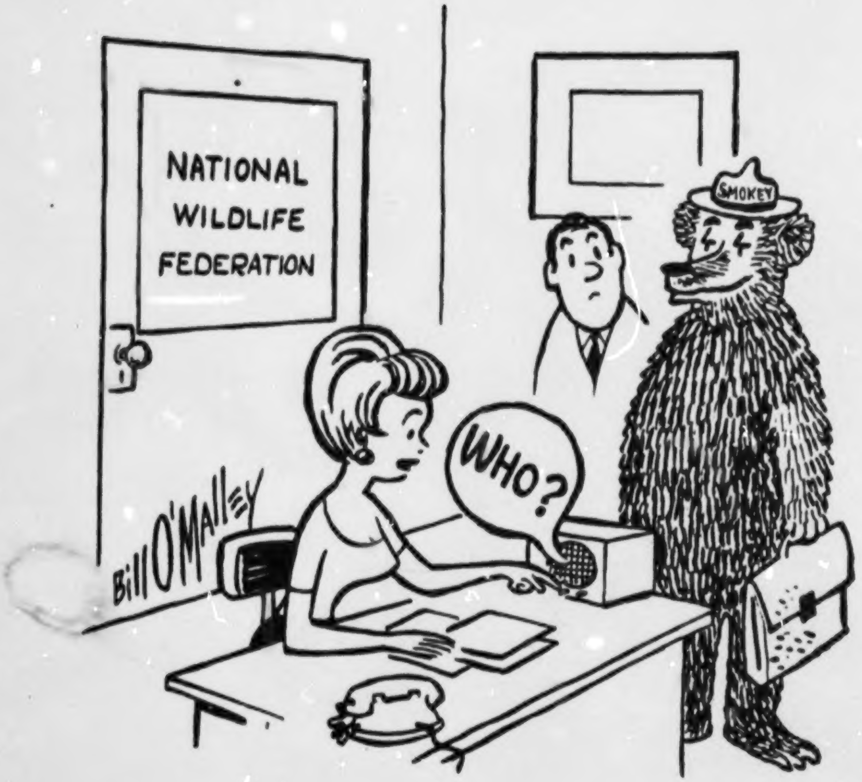
During the rise of conservation as a national policy in the United States, concerned individuals led the way by awakening the American people to the need for care for the natural environment. Through individuals, who's writings and political efforts provoked and fostered effective governmental policy regarding the environment, Americans become interested in conservation. All of the major problems, issues and conflicts in the development of an enlightened attitude toward the land can be traced through these "conservation heroes."

Before You Begin

Materials: a variety of biographical materials, encyclopedias, National Geographic Index, conservation related periodicals, Audubon Magazine index.

Words To Know

conservation, hero, career


NATIONAL WILDLIFE FEDERATION
SMOKEY
WHO?
Bill O'Malley

A Bill O'Malley cartoon

Conservation News 9-15-73

ACTIVITY

1. Ask your students to select a conservation hero (heroine) from the suggested list (attached) or find one of their own.

2. Assign research time for information collecting about the chosen individual or group. Librarian may be asked to assist in aiding the student's research. The students may be inclined to write letters to recommended groups and organizations for further information on particular individuals.

3. After information is collected, ask students to prepare a conservation Hall of Fame. Each exhibit should include some of the follow following:

   a. Picture, drawing or photograph of the hero.

   b. Time line of events - individual's accomplishments and failures.

   c. An article of clothing the person might have worn.

   d. An object that might have been treasured by this person.

   e. A picture or diagram that tells about their greatest accomplishment.

   f. Information card with an explanation of exhibit.

4. Ask students to make a small museum display on a board or in a box.

5. Set up Hall of Fame and allow time for presentation of chosen heroes.

Related Activities

1. Research the following clubs and organizations and prepare an exhibit of them. Write letters to determine their function and founders:

League of Women Voters of the U.S., 1730 M. Street, NW Washington, DC

National Audubon Society, 1522 K Street, NW, Washington, DC

National Wildlife Federation, 1412-16th Street, NW Washington, DC

Sierra Club. 1050 Mills Tower, San Francisco

National Assoc. of Soil and Water Conservation District
Vermont Avenue, NW, Washington, DC 20005

The Izaak Walton League of America, 2326 Wauekegan Road
Glenville, IL 60025

Garden Club of America, 598 Madison Avenue, NY 10022

The Conservation Foundation, 1250 Connecticut Avenue, NW
Washington, DC

The Urban Coalition, 2100 W Street, Washington, DC

The E. S. Environmental Protection Agency, Washington, DC 20037

2. Spend time interviewing a local environmental protector by letter, phone, in person. Find out about this person's life story, past experience, training ambitions, values. Write an editorial about this person and include in the environmental hall of fame.

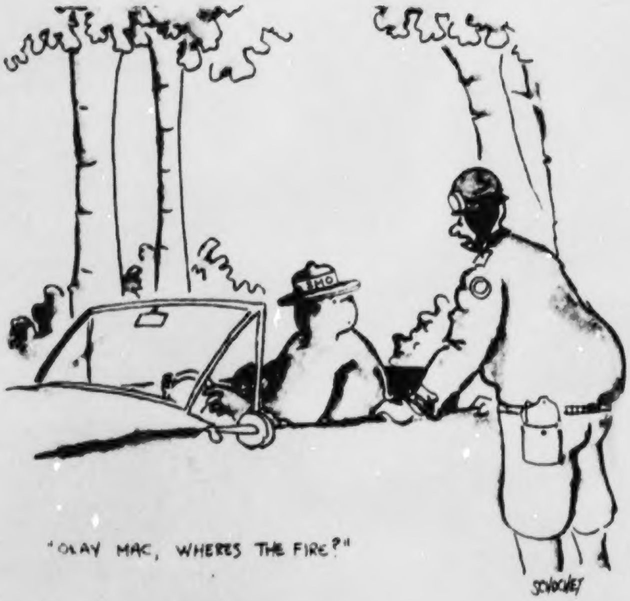
3. Write an autobiography of you - an average American student who has decided to become a National hero as an environmental protector. In your life story include the major accomplishments that you will achieve in your lifetime and what national heroes have influenced you. (From: Environmental Law, Computer Based Resource Unit, NY State University)

Resources

Forte, I. and J. Mackenzie, Kids' Stuff, Incentive Publishers, 1976.

State University College at Buffalo, NY, Computer Based Resource Unit, Environmental Law: Obj. #33.

Notes To Myself



"OKAY MAC, WHERES THE FIRE?"

Conservation News 11-1-75

STUDENT PAGE

SUGGESTED LIST OF CONSERVATION HEROES

Pete Seeger - musican, protest song writer
Green Peace - portest group on whale killing
Lady Bird Johnson - former First Lady of the United States
John Muir - founder of the Sierra Club
Senator George McGovern - powerful advocate of environmental concerns
Joseph Sas's - professor, author of the book Defending the Environment: A Strategy for Citizen Action, Alfred A. Knopf, 1971
Jacque Cousteau - French naturalist
Gifford Pichard
Fredric Law Olsmestad
Henry D. Thoreau - author of Walden's Pond
Ernest Hemmingway
Thomas Jefferson
Russel Train
President Teddy Roosevelt
Tom McCall - Oregon's governor, former journalist, TV newscaster, defender of environmental quality - making a model state excellent article in Audubon Magazine, Sept. 1973 pp pp. 130-132.
John Burroughs
Balanger

Dreaded Creatures

Curriculum Topic
BEHAVIOR

Environmental Topic
ENVIRONMENTAL ETHICS

Skills
Data collecting,
communication skills

Subject
Social Studies

Grade Level(s)
3-5

Site
Classroom

Author
Cyndi Walsh

Objective

The student will be able to:

1. define the concept prejudice
2. describe conditions that are responsible for human fear of organisms and ways in which these fears are expressed.
3. demonstrate an awareness that all living things (organisms) are inherently neither good nor bad and exhibit crucial interrelationships.

To The Teacher

Demon snakes, paralizing spiders, blood sucking bats and flesh-eating sharks are just a few creatures who have suffered from bad public relations. Are all bats blood sucking? Spiders paralyzing? No! Horror movies, advertizing and ignorance are often the basis for bad reputations and unfounded beliefs.

This activity serves to define the problems of prejudging, while encouraging a respect for all of nature. The following procedure can be adapted to the sophistication of your group. Ideas are offered as helpful guidelines.

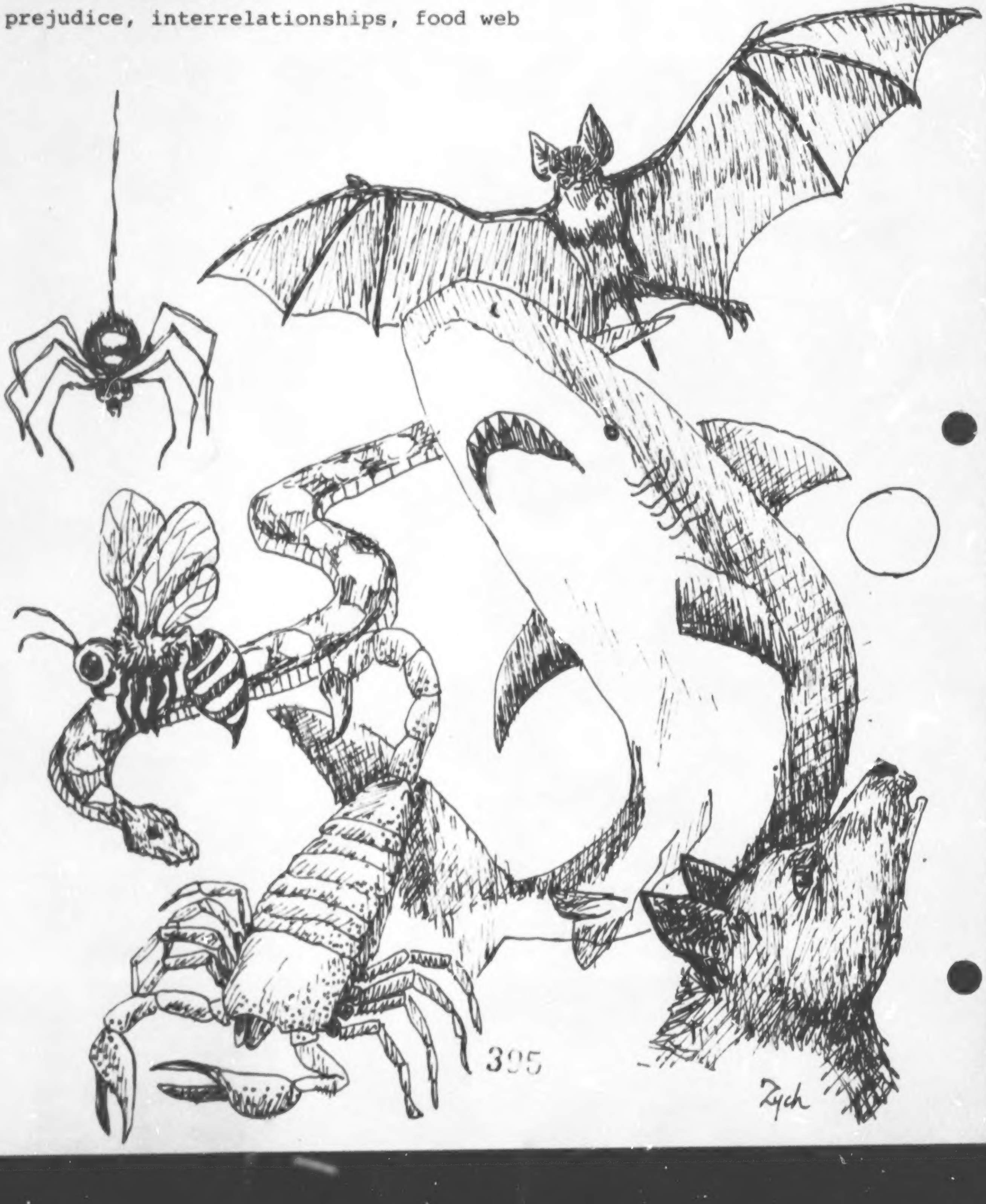
Before You Begin

Materials: assorted art materials

Preparation: Collect resource materials explaining life cycles and behavior of animal life.

Words To Know

prejudice, interrelationships, food web



ACTIVITY

1. Ask students to ask family and friends which animals they most dread, fear or hate.

2. Compile a master list of all dreaded creatures.

3. Tell 1/4 of the class that they have been given the power to destroy all of the dreaded creatures and to start a new world. For every animal they do retain, however, they must make a working food web.

4. Each student in the remaining part of the class assumes the role of an exiled creature and must campaign to be readmitted into the living world. These students will attempt to disprove unfounded prejudices and beliefs about their characters.

5. Each exiled creature must prepare a report which includes the following information.

   a. it's own physical characteristics

   b. description of habitat, behavior

   c. relationship to other animals and humans.

   d. reasons why the animal is endangered, threatened, dreaded and mistreated (DDT, hunted, stepped on).

   e. description of food web and effects upon it and upon the world if eliminated.

6. The utopian town must vote on the merits of the exiled creature and vote to decide its fate. The town must feed and shelter each creature elected to survive in the manner to which it is accustomed. (i.e. A spider that returns must also bring its food.)

7. Campaign format will depend on the sophistication of the group. The following are a few ideas to encourage creative expression of researched materials on the dreaded creatures.

   a. Stage point and counterpoint debates to dramatically illustrate the complexities of man's interdependence with nature (DDT issue)

   b. Write new words to old songs. A catchy familiar tune may be used to sing the praises of the bumble bee.

   c. Catchy language patterns from TV commercials used as blueprints can be transformed to promote the merits of a dreaded creature, i.e. "I don't believe I ate the whole thing!"

8. When all "dreaded creatures" are returned to their proper places, further discussion on prejudices can take place.

Related Activities

1. Students may wish to create a puppet show illustrating a food web that man has altered (i.e. reducing bird population by killing pesty insects).

2. Role play of an interview with a kindly shark who is upset with movie "Jaws."

Credit

Drawing: Cecelia Zych

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The Glut

Curriculum Topic

SELF AWARENESS

Environmental Topic

ENVIRONMENTAL ETHICS

Skills

Recognizing problems, generating alternate solutions

Subject

Social Studies

Grade Level(s)

3 - 5

Site

Classroom

Author

Cyndi Walsh

Objective

After reading "The Glut" the students will be able to:

1. describe their personal relationship to thoughtless polluting,
2. create a plan of action.

To The Teacher

Individual acts, duplicated or compounded produce significant environmental alterations over time. Social values and mores can influence conservation behavior. After a discussion of pollution and it's causes it is most desirable to talk about prevention of the phenomena in a realistic manner. A keen perception and evaluation of pollution problems can be encouraged by role playing the attached story. Internalizing the concept thoughtless pollution should grow out of writing sequels to the story. After discussion of suggested solutions an important process should take place, a self evaluation and analysis during which students ask themselves "can I really do what I have proposed? Can I break the thoughtless glut behavior pattern?" The following activity could fit nicely into a selfawareness study on developing habits, and leave the students with a plan of action and a sense of hope.

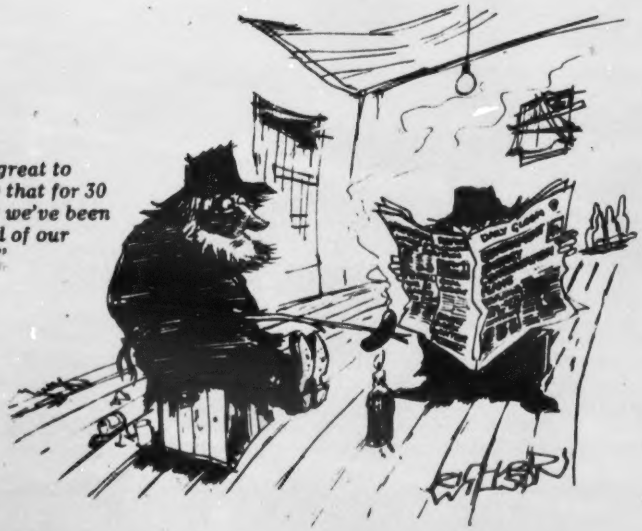
Before You Begin

Duplicate the story of the Glut and a series of value continuums which follow. The student will need paper and pencil, art pencils.

Words To Know

glut, conservation, pollution, recycle, natural resources

Notes To Myself



"It's great to know that for 30 years we've been ahead of our time."

Courtesy NEW SCIENTIST

Conservation News Vol. 40 No. 3

ACTIVITY

1. Distribute copies of the story, The Glut, to each student.

2. Ask the students to break into small groups and prepare to role play The Glut family episodes.

3. Ask the students if they can think of other scenerios that may have happened in the Glut Family household. Discuss how easy it is to point a finger at others. Can they think of times when they have become a glut? Discuss the process of ungluting as breaking a bad habit may follow. Remind the students that it is just as easy to form good habits. Do they have any glut behavior that should be unglutted? Students will enjoy the play on words and could develop into a good parts of speech lesson.

4. Using the format presented in the story as a model, have the students create a sequel to the Glut family story. However this time it should be limited to glut behavior of people their own age...as they are setting an example for others to follow. Students seem to find it easier to criticize others and this should be prevented as it could be damaging to the overall goals of this activity.

5. Have each student prepare to role play their glut episode to the class.

6. As each episode is presented ask each student to recognize the difficulty involved in breaking (ungluting) the habit presented by placing the solution on a continuum. (See sample continuums attached to this unit.) Looking at our continuums have we proposed a practical and realistic plan of action? Can we unglut?

7. Ask the student to put the glut stories and continuum in a private place and to personally evaluate their own ungluting progress on a monthly basis. (Depending on the course of events, ungluting may become a common term in your classroom and a follow up activity may be desirable.)

Related Activities

A. Ungluting awards for good behavior.

B. Ungluting review board to talk about the success and failures in their attempts to break their own bad habits.

C. Advertisements to promote ungluting behavior in the classroom. (Use both sides of your paper...don't glut)

Resources

Fun With the Environment, U.S. Environmental Protection Agency, Washington, D.C. 20460, EEC 27.9.

STUDENT PAGE

SAMPLE CONTINUUM*

Solution: Episode One

Shorten Shower

Easiest to unglut.....................................almost impossible

Solution: Episode two

Cut TV time

Easiest to unglut.....................................almost impossible

Solution: Episode three

Turn off lights

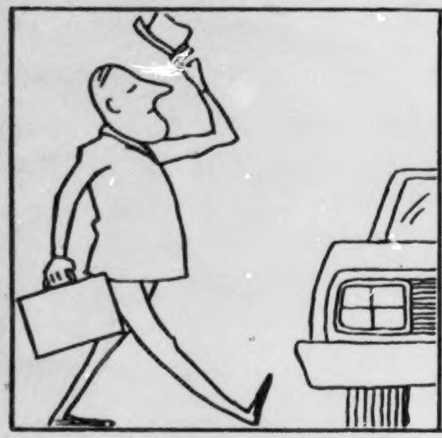
Easiest to unglut.....................................almost impossible

*You may want to devise your own scale with your class.

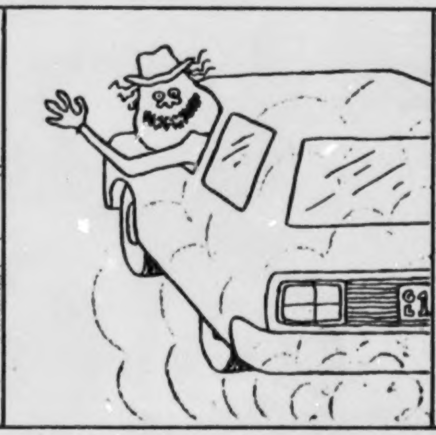
A REAL-LIFE HORROR STORY

THE GLUT

HOW MILD MEMBERS OF AN AVERAGE FAMILY TURN INTO THOUGHTLESS POLLUTERS



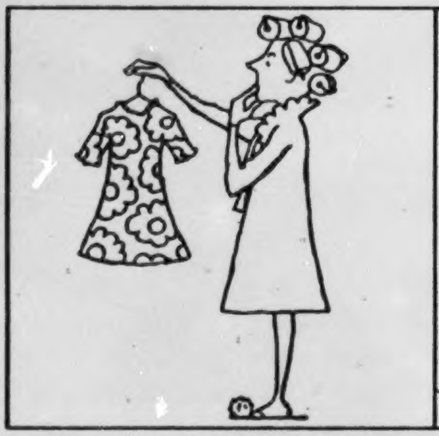
Mr. Average leaves for work.



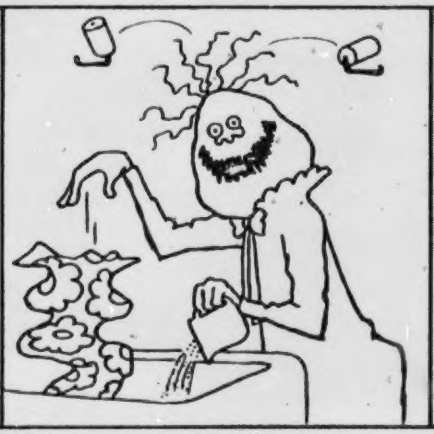
And he becomes a GLUT by driving to work alone!

HOW TO UN-GLUT:
Walk —
or ride a bicycle —
or take a bus —
or join a car-pool.

Cut down on air pollution and traffic noise.



The dress Mrs. Average wants to wear to P.T.A. is dirty.

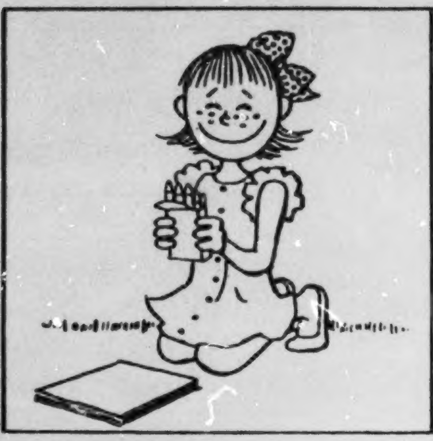


She runs the washer for just one dress and becomes a **GLUT**!

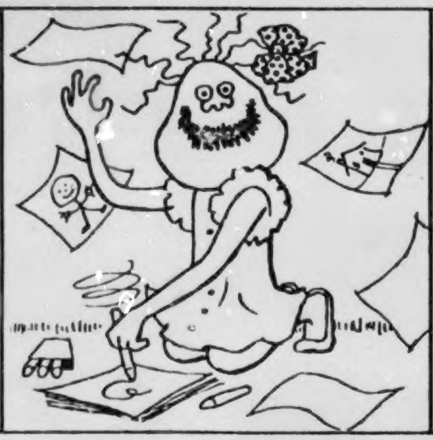
HOW TO UN-GLUT:
Wear another dress —
or wash it out
by hand —
or plan ahead
to always wash
a full load.

(Power companies have pollution problems too.)

Save electricity and water. Cut down on air and water pollution.



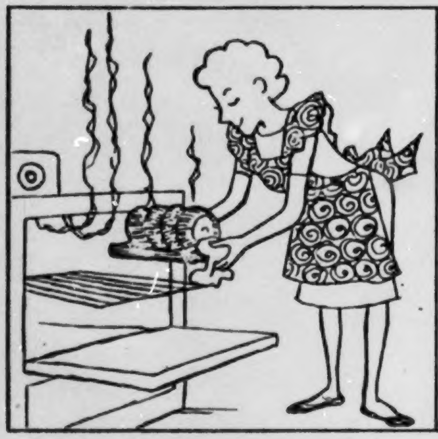
Sister Sue is an artist.



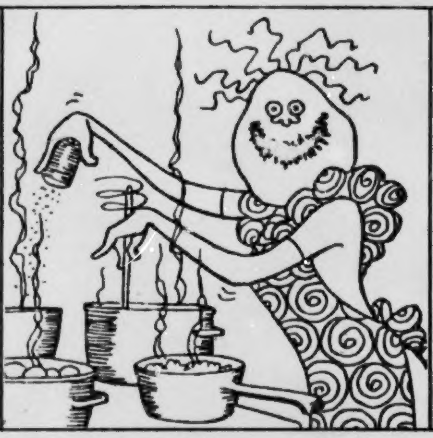
Now she's a GLUT! See how she's wasting paper!

HOW TO UN-GLUT:
Use both sides of the paper.

Save paper. (Paper is made from trees.) Make less trash.



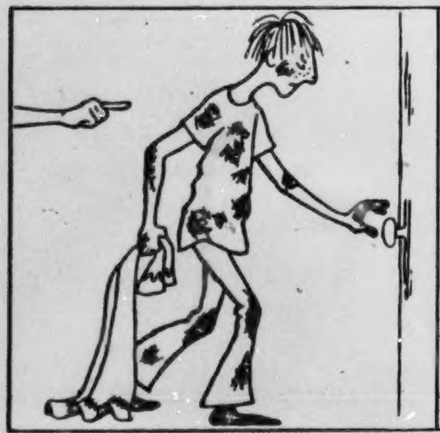
Mrs. Average has a big roast cooking in the oven.



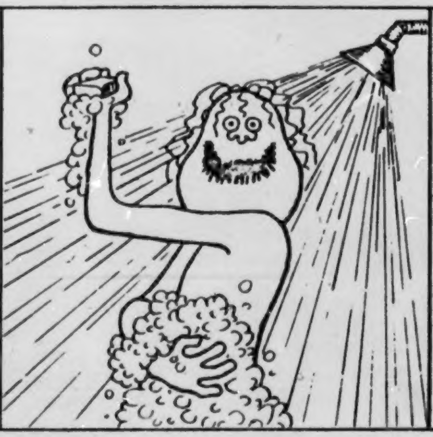
She cooks the rest of the meal on top of the stove and becomes a GLUT!

HOW TO UN-GLUT:
Since the oven is on anyway, try to cook some of the vegetables and other foods with the roast, and not use the burners so much.

Save electricity or gas; help cut down on air pollution.



Brother Ben decides to take a shower.



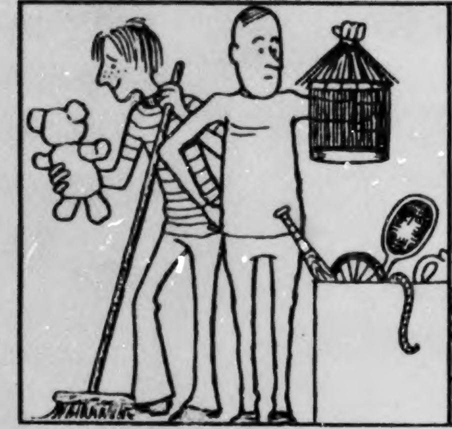
And he becomes a GLUT by using GALLONS of water.

HOW TO UN-GLUT:

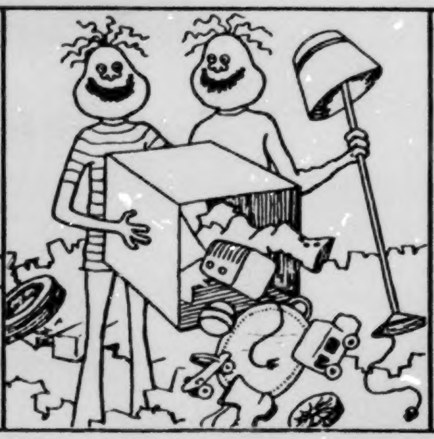
1. Run just enough water to get wet.
2. Turn off water.
3. "Soap up."
4. Turn on water.
5. Run just enough water to rinse off.

(The average shower takes up to 60 gallons of water)!

Save GALLONS of water. Save the gas that heats the water.



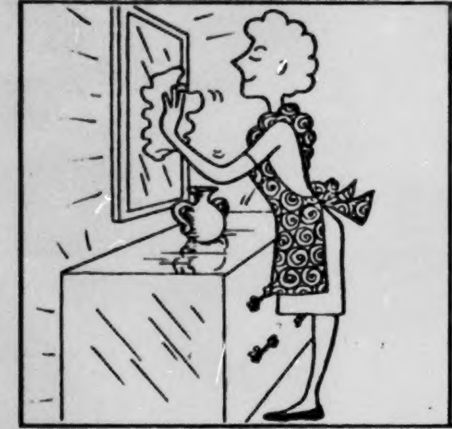
Mr. Average and brother Ben clean out the basement.



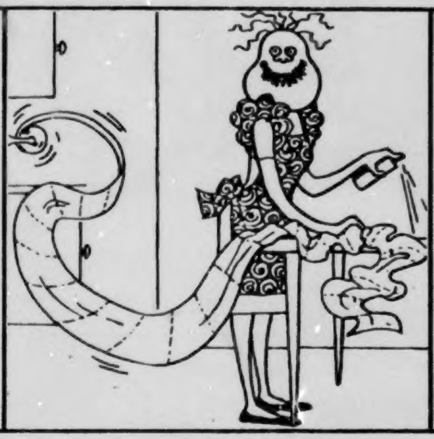
They throw away things that can still be used. **GLUTS!**

HOW TO UN-GLUT: Others can use things you don't need. Recycle them – have a garage sale or give them to a charitable group. Find out where to give in your town.

Save natural resources by not constantly needing new things.



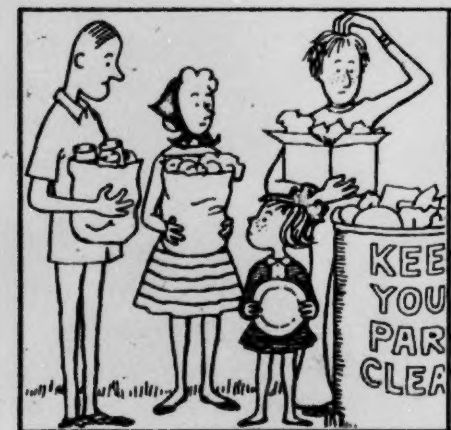
Mrs. Average keeps a clean house.



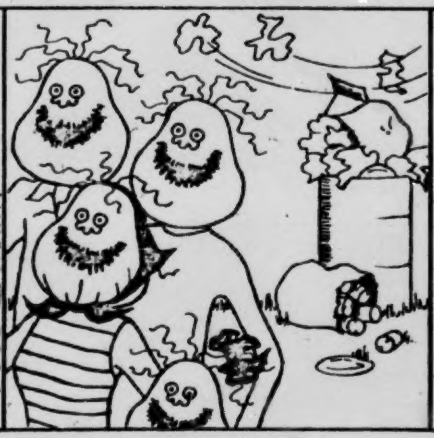
But she uses many, many paper towels and becomes a **GLUT**

HOW TO UN-GLUT: Make a rag bag. Worn-out clothes, towels and sheets are good cleaning rags. They can be washed again and again.

Save paper. (Paper is made from trees). Cut down on trash.



After a picnic, the Averages find that the trash cans are full.



But the **GLUTS** leave their trash anyway!

HOW TO UN-GLUT: If there's no place for it, take your trash home to your own trash can.

Remember:
Every
Litter Bit
Hurts!

Keep wind-blown trash from littering.

SEE HOW EASY IT IS TO BECOME A GLUT? JUST UN-THINK!

Make a Time Capsule

Curriculum Topic

SELF AWARENESS

Environmental Topic

ENVIRONMENTAL ETHICS - If we are to live harmoniously with each other and our environment, we must develop both a way of thinking and a way of feeling about the earth.

Skills

Acquiring, verifying, applying, communicating and evaluating information.

Subject

Social Studies

Grade Level(s)

3 - 5

Site

Classroom

Author

Paul Sanderson

Objective

The student will be able to:

1. gather items to contribute to a time capsule
2. evaluate individual personal growth over a period of a year.

To The Teacher

Young children, like the society in which they live, experience considerable growth during the schoolyear: physical, academic, and emotional. Unless records are kept, it is difficult to observe these changes. Record-keeping may be carried one step further than the task itself when the class creates a time capsule. With this tool, students will observe shifting attitudes about self over a period of several months. And, by keeping a record of current events over an extended period of time, students will gain a perspective on the ever-changing social and political climate of our era. Of equal importance will be the observation that though much around us changes, much remains the same.

Before You Begin

Materials: One large container to serve as a time capsule. Construct from found materials, or use a large cardboard box. The only requirements are that it closes tightly and stores easily. The following materials are optional: a camera(s), tape recorder and tapes.

Words To Know

time capsule, compare, documents, current events, environment

ACTIVITY

1. Introduce the activity by defining the term time capsule. Discuss purpose, content and location of time capsules.

2. Explain that the class will make a time capsule, to be opened at the end of the year. Ask for ideas on what to put into the capsule. Some suggestions follow:

a. Student pictures - depending on availability of equipment, these may be group or individual photos.

b. Tape recordings, movies, newspaper articles or other items which document current events.

c. Results of exercises dealing with environmental issues.

EXERCISE 1: Rank order environmental issues according to most important (1) and least important (10). A few environmental issues are: air and noise pollution, endangered species, solar energy, nuclear energy, land use, recycling and energy conservation.

EXERCISE 2: Construct a value continuum having an environmental theme, such as:

What do you know about our environment?

Very Much ____ Very Little

Mark an X, placing yourself on the continuum.

3. Sort and organize the materials and place them in the capsule.

4. Decide as a class on a date to open the time capsule.

5. Seal the capsule and mark the date to be opened.

6. Store in an unobtrusive place, such as a locked closet.

Related Activities

1. On the appointed day, open the time capsule and compare physical and attitudinal changes which have occurred in the students. Do you think you have changed from last year? How? Has the school, town, world changed since last year? How? Discuss these, sharing changes or lack of change.

2. Have the students redo the surveys, value continuums, rank orders, etc. to compare with those they did at the onset of the time capsule project.

3. Take new individual photos, acquire new materials and post them on display as a "before and after" comparison.

4. Discuss the possibility of resealing the capsule and opening it again at a later date. Would you include different materials than those you chose for the first capsule? Why?

Credit

Ann-Marie M. Fleming, contributor

My Place

Curriculum Topic

LANGUAGE ARTS
SELF-AWARENESS

Environmental Topic

ENVIRONMENTAL ETHICS

Skills

Observing, experimenting

Subject

Language Arts/Social Studies

Grade Level(s)

3-5

Site

Outdoor area which ideally provides option of many habitats or schoolyard

Author

Sandy Price

Objective

The student will be able to:

1. find an outdoor setting that is attractive to the student.
2. choose some way to share his/her feelings about this special place with other students.

To The Teacher

Students must develop both a way of thinking and feeling about the earth if we are to live harmoniously with each other and our environment. But this concern for the environment is preceded by an individual's healthy self-image.

The purpose of this activity is for students to have personal, reflective, and creative experiences in the outdoors.

Students will be given time to be alone and then encouraged to respond to the experience with their own ideas and feelings. Often students are required to observe and learn only what educators present to them. Here they will follow their feelings to experience what is immediately perceived and relevant to them.

There is wonder, variety, beauty, power, conflict, and serenity in nature as reflected in human beings. Children should have the opportunity and encouragement to find these qualities in themselves. As Janet Nickelsberg remarks, "Nature study, as I understand it... is a means by which children are able to come in contact with things that appeal to them without interference of man's inventions and interventions." As they learn to value themselves and thus the natural world they are then motivated to care for and respect all things which they contact.

Prior experience with affective education activities might make this a better lesson. Otherwise, this can be a good place to begin with activities that encourage the children's sensitivity and valuing.

Before You Begin

Materials: paper, pencils, art materials (crayons, glue, charcoal), appropriate outdoor clothing

Time: 3-4 class periods, depending on how much time is used for sharing.

Caution: Agree upon and lay out boundaries for exploration.

Credit

"An Individual Experiment", Project Learning Tree, American Forest Institute, Inc., 1977.

Notes To Myself

ACTIVITY

Day 1: Each student is to find a place outdoors that appeals to him/her and then spend time in that place.

1. Begin with a brief discussion to set a tone for the activity. The teacher might say:

   a. that this time is available for each student to pay attention to both him/herself and the outdoors,

   b. that there is no hurry to arrive somewhere or to learn any set of facts,

   c. that this is an experience, not a lesson to be graded, and

   d. that each student may choose something to share with the class from this experience.

2. Encourage students to anticipate some things to which they might pay attention as they look for and spend time in their individual "places", (i.e. wind, sounds, colors, warmth, textures, openness or enclosure, brightness, variety, size, movements, smells). Further talk about some things they might notice in themselves (i.e. energy, calm, fear, surprise, confort, delight, familiarity, anger, tiredness). Encourage students to experiment in their chosen places (i.e. run, crawl, yell, sing).

Day 2: Each student does a creative activity in his/her place.

1. Discuss with the students that today when they go to their "places" they should concentrate on a particular aspect of it by making something they can share with their friends. Discuss examples of the forms of this sharing (i.e. draw a picture, make up a dance that fits your own mood or movements which you see, arrange an art form using materials found there, write a poem, sketch a variety of leaves or trees, describe your daydream, write about what your five senses are noting).

2. Each student spends 20 minutes in his/her chosen place doing a special activity.

Day 3: In groups of 5 or 6, students share the products of the activities done in their "places". Encourage them to discuss:

   a. What the experiences of creating were like.

   b. What they have learned and appreciated about their outdoor "places".

   c. What they have learned about themselves.

If possible, allow the students to do the sharing in each other's special "place."

Related Activities

1. The students might like to share with another class the experiences and creations from the activity.

2. The students might want to spend time in their chosen places at different seasons and note changes.

What is "It"

Curriculum Topic

SELF AWARENESS

Environmental Topic

ENVIRONMENTAL ETHICS

Skills

Observing, brainstorming, intuiting, developing self-confidence and self awareness

Subject

Social Science

Grade Level(s)

3 - 5

Site

Classroom

Author

Orah Elron

Objective

Each student will be able to:

1. interpret a picture in his own way
2. compare his interpretation with those of classmates
3. deduce differences in the ways individual people think.

To The Teacher

Children at the pre-teen age often assume that their friends and classmates think and act as they themselves would in a particular situation. This activity will help them to see how different people can react to the same stimulus. They also will understand that everyone has something new and special to add to other's ideas. Many people together can create more than one alone.

In this activity, students will be exposed to the concept that people have the responsibility to develop appreciation and respect for the rights of others. A healthy self-image is essential to becoming truly concerned about the environment. This activity can be approached in several ways as part of a study about self and the human body.

Before You Begin

Make copies of the student sheet (It) for each student. Students may write on the sheet itself or on additional pages. Students will need crayons and pencils.

ACTIVITY

1. Introduce the "IT" and give each student a picture of "IT". What might "IT" be? Ask them not to tell their responses to anyone, but to write them down. Let the students look at their picture, turn it in all directions, color it if they wish, and write all they think in detail: "What is "IT"? What can "IT" do? What is "IT" for?...

2. Ask students to sit in groups of four and compare their notes. Have all students in one group seen and described the same things or were their observations different from one another? Ask groups to compile and summarize their ideas on a group worksheet.

3. Representatives will present the ideas, notes, conclusions of each group to the class.

4. Class discussion: a) Do all students (of equal age) see things alike? b) Do we enrich our experience and knowledge when we learn about other people's point of view? c) Is it difficult to accept other people's ideas? Why?

Related Activities

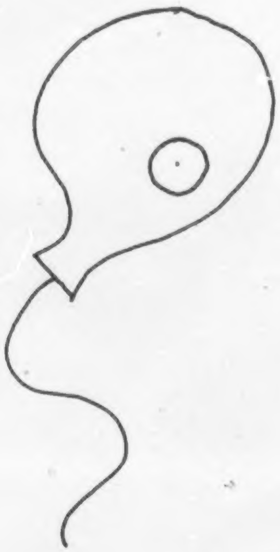
This same activity can be done with the use of an inkblot instead of the "IT". Groups of 6 will spray a few blots of colored ink on white paper and fold it in the middle, rub above folded sheet with back of the hand and unfold the paper. The resulting, symmetrical ink-blot might inspire students to see several different pictures (as Rorschach used in testing).

Resources

Halperin, Miryam and Orah Elron, "Who are We?","Matal", Tel Aviv University, 1976

Notes To Myself

"It"



Talk to a Whale

Curriculum Topic

ENDANGERED SPECIES
LANGUAGE ARTS
CURRENT EVENTS

Environmental Topic

ENVIRONMENTAL ETHICS - The earth's resources exist for all living things, not just man. If human beings protect the earth, it will be able to support a diversity of living things.

Skills

Writing
Identifying feelings about alternatives

Subject

Social Studies
Language Arts

Grade Level(s)

5

Site

Classroom

Author

Paul Sanderson

Objective

The student will be able to:

1. make a statement of feeling or concern for an endangered species.

To The Teacher

Besides having the largest bodies on the face of the earth, whales also have the largest and, in some ways, the most complex brains of all living creatures. Their cerebral cortices, the most evolutionary advanced part of the brain, is more convoluted and of larger area than human cortices. Whales stand next to humans in several critical areas of brain development: ratio of spinal chord to brain weight, ratio of brain to body weight, extent of "association" neurons in cortex (these allow more complex behavior than simple stimulus-response areas) and brain cell differentiation. Some authors have placed cetaceous (whales and dolphins) between people and apes in "intelligence."

Behavioral scientists are quite cautious in their statements about whales, but, in spite of the difficulties in studying these creatures, have concluded that whales are, in fact, highly developed. Whales show evidence of being aware of themselves and their surroundings and exhibit complicated social behavior. Anthropomorphic and romantic authors have attributed to whales loyalty, courage, play, love and other human emotio and behaviors.

These unprovable assumptions may be testable if we learn to communicate with whales and dolphins. Whales have an extremely refined sense of hearing. It has been shown that they use echolocation for navigation and also that some of their signals are for communications purposes. On the basis of this evidence some writers make the unwarranted assumption that whales "talk". Bird songs are also a form of communication. If whales are as intelligent as scientists suspect, it should be possible for us to communicate with them as we have learned to with primates.

Presuming the day will come when we say our first "hellos", what will we say to whales? In fact, our first words may be apologetic, for we have, for many years, methodically hunted and killed whales and dolphins almost to the point of extinction of the species.

In this activity, students are given the opportunity to communicate with whales. As spokespersons for the human race, what will they say?

Before You Begin

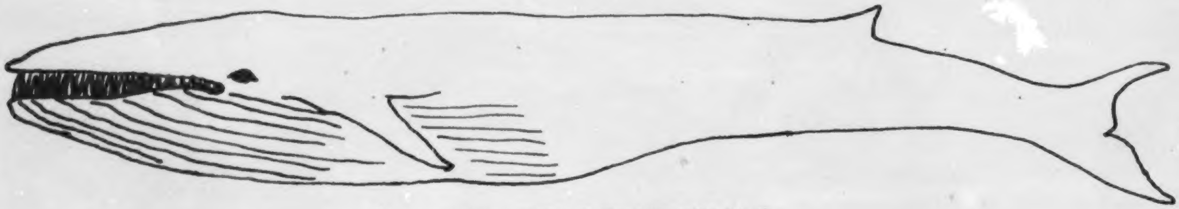
Materials, Preparations, Cautions:

1. Spend some time acquainting your students with whales and dolphins. Learn about their lives: eating habits, reproduction, habitat, life cycle. Also discuss the subject of whaling, and how whale populations are becoming depleted. Several curriculums are suggested at the end of this activity.

2. Make available to the students books, pictures and information on whales. Students will also need pencil and paper. A tape recorder, if available, will help some students organize their thoughts.

Words To Know

extinct, communicate, endangered species, whale, dolphin



THE GREAT BLUE WHALE

ACTIVITY

1. Explain to your students that you are giving them the "key" to communication (talking or writing) with whales (or dolphins).

2. Ask them to prepare a statement that they would give to the whales, especially in lieu of how we have treated them.

3. When the statements are ready, read them aloud to the class.

4. Ask the students to find common themes in their writing. Did they say "hello," "we like you," "how are you?", "sorry we have killed you"?

5. Find the common feelings that were expressed (shame, pride, anger, frustration, sadness, concern, hope, fear).

6. What approaches did the students use in their writing? (questions, apologies, statements, demands)

7. What can the students do to improve their relationships with whales and other species? Mention speaking out against whaling countries, boycotts, petitions, whale study.

Related Activities

1. Have the students limit their "ability to speak" to only 25 words. What would they say then?

2. Have the students "speak for" the whales. What do you think *they* would say to *us*? Why? Would they forgive us?

Resources

Morgane, Peter, "The Whale Brain", *Mind in the Water*, ed. Joan McIntyre, Scribner's, 1974, pp. 84-93

Roever, J.M., *Whales in Danger*, Steck-Vaughn Co., p. 175, EEC #M67

Rycroft, Lois U., "A Unit for Teaching About Whales," Connecticut Cetacean Society, Wethersfield, CT, 1976 EEC# 703.1

The Whalebook, ESP: Endangered Species Productions, Boston, 1974 EEC #726

There's a Sound in the Sea, ed. Tamar Griggs, Scrimshaw Press, 1975, EEC # M34

Credit

Steve Gold, contributor

Critical Issues

Curriculum Topic

CURRENT EVENTS

Environmental Topic

ENVIRONMENTAL ETHICS

Skills

Reading, analyzing, speaking, locating and obtaining information

Subject

Social Studies

Grade Level(s)

5

Site

Classroom, library

Author

Betsy Giovine

Objective

The student will be able to:

1. prioritize critical environmental issues
2. research environmental issues

To The Teacher

In order to present this research project properly it is important for the teacher to be generally acquainted with these issues(or select environmental issues you are already familiar with):

1. Destruction of the ozone layer by use of aerosol propellants. Fluorocarbons are usually inert chemicals sprayed into the air as propellants in aerosol cans. In the stratosphere, these chemicals break down and release chlorine gas. The chlorine acts as a catalyst to break down unstable ozone molecules in the upper atmosphere.

2. Destruction of whales. Many species of whales have been hunted to the brink of extinction. The principal whale product is whale oil. A substance quite similar to whale oil has been discovered in the jojoba plant, which grows in southwestern North America. If this product becomes a viable substitute, and if the International Whaling Commission can be persuaded to tighten and enforce existing regulations, the whales may yet be saved.

3. Control of nuclear arms. The dangers of nuclear weapons proliferation are obvious. So are the difficulties in controlling them, as the failure to reach agreement after long negotiations at the SALT II conference attests. Of possibly greater importance than the arms race between the major powers is the increased availability of atomic power plants and nuclear expertise which make the option of producing nuclear arms available to more and more nations.

4. Lack of food for the world's people. Some 400 million of the world's people are malnourished or starving. In some areas there simply isn't enough food to go around; elsewhere the supply is adequate but the populace is too poor to buy it. Increased food production in the less developed nations are needed to reduce the incidence of malnutrition.

5. Rapid growth of world population. This may be the root cause of most environmental problems. If current trends continue, the world's population will double every 41 years. By 2000 there will be six billion people on a planet which is straining to hold four billion. Increasing population causes greater demands on energy, mineral resources, land for food production, the economic system for employment, and the natural system for pollution capacity. Although nearly all countries have some kind of family planning policy, few have been successful. Some economists feel that population growth can only be stabilized after a reasonable standard of living can be provided to dwellers of less developed countries.

6. Poor living conditions throughout the world. In less developed countries annual per capita incomes rarely reach the $200 level. Since income is very unequally distributed in most of these countries, the lower classes often live in abject squalor. Unable to afford firewood, they burn dried dung to heat their ramshackle homes, depriving their lands of vital fertilizer. The quality of life in such countries is truly deplorable. But poverty is not restricted to other lands--39 million Americans cannot afford adequate food, housing, and medical care.

7. Water pollution. Water pollution is an increasingly critical problem. Although water is constantly cycled through the environment, our supply of usable water is steadily diminishing. Our lakes, streams, wetlands and even oceans are all threatened. Water pollution includes raw and treated sewage, hot water from power plants, industrial wastes such as mercury, kepones and other toxic chemicals, fertilizer and pesticide runoff from cropland, air pollutants falling on or dissolved in water bodies, oil spilled from tankers and other facilities, etc. The cumulative effects of this pollution are unknown, but there have been cases of serious effects on human health and the natural environment.

Our understanding of the severity of these issues will have a tremendous effect on the world in the future. Environmental ignorance is probably one of the most serious situations with which we must deal. By becoming aware of these current issues we cannot avoid the idea that each individual must develop some sense of responsibility toward the environment if we expect future generations to survive.

Before You Begin

overhead projector, library research books, recent periodicals

Prepare an overhead transparency with the following list:

1. Destruction of the ozone layer of the atmosphere by use of aerosol cans.
2. Destruction of whales.
3. Rapid growth of world population.
4. Lack of food for the world's people.
5. Control of nuclear arms.
6. Poor living conditions throughout the world.
7. Water pollution.

Words To Know

ozone layer, nuclear arms, pollution

Notes To Myself

ACTIVITY

1. Show the transparency and ask someone to read each issue aloud.

2. Have students make their own copies of the list.

3. As a class rank the issues from 1 to 7, with 1 indicating the most critical and 7, the least.

4. Assign the class to research each issue on the list. Use reference books and recent periodicals (magazines).

5. Allow one week for research.

6. At the end of the week discuss the issues one at a time and rank the issues again. Note any changes in the numbers.

Related Activities

1. Brainstorm ideas which would help to alleviate the problems involved in these issues.

2. Write to your congressman/women to find out what legislation is being worked on to alleviate these problems.

3. Bring in newspaper or magazine articles or other critical environmental issues.

Resources

Here are some sources of information on the major environmental issues considered in this activity. They have been chosen for brevity, clarity, and availability at the EEC library. They provide no more than the barest bones of knowledge about these subjects. Books have been written about them all; if interested, you are urged to probe more deeply.

Ehrlich, Paul R. and Anne H. Ehrlich, Population, Resources, Environment, W. H. Freeman, 1970, pp. 1-3 and 321-324, EEC #C4. (POPULATION)

Environmental Pollution Panel, President's Science Advisory Com Committee, Restoring the Quality of the Environment, 1965, pp. 7-73, EEC #G60. (WATER POLLUTION)

Heilbroner, R. L., "What It's Like to be Underdeveloped", in Population, Antioch Community School District 34, pp. 92-93, EEC #1475B.

Houk, J. P. and W. Barr, "Will There Be Enough", B. F. Jones et al "Who Will Get It", and J. Armstrong et al, "How Will It Be S Shared", all in "Your Food", Ohio State University Cooperative Extension Service, July 1976, EEC #1486. (FOOD)

McIntyre, Joan, "Whaling: A Dying Industry vs. A Dying Order", in The Whalebook, edited by Phoebe Wray, Endangered Species Productions, 1974, pp. 40-48, EEC #8726. (WHALES)

Sullivan, W. "Concern Over the Ozone Layer", New York Times, March 31, 1975, EEC vertical file. (OZONE)

Credit

Osprey-the EEC Newsletter, Vol. II, No. 9, May 1978, p.5.

Accidental Victims

Curriculum Topic
CURRENT EVENTS

Environmental Topic
ENVIRONMENTAL ETHICS

Skills
- Brainstorming
- Generating alternative solutions
- Recognizing problems
- Values clarification

Subject
Social Studies

Grade Level(s)
3 - 5

Site
Classroom

Author
Cyndi Walsh

Objective

The student will be able to look at all consequences when generating solutions to a problem.

To The Teacher

In an environment of constant change, it becomes necessary to incorporate current events into the curriculum. Asking students to bring to class controversial and pertinent news items is an easy way to supplement any subject area. This activity can serve as a model for using environmental current event controversies in the classroom. Suggested strategies for analysis of the issues follows: (from: Charlotte-Mecklenburg County Schools, Charlotte, North Carolina)

Continuum - The teacher draws a long line on the board. The teacher and the class determine two polar positions on an issue. The positions are placed at the opposite ends of the line, and a series of points are marked along the continuum. The teacher whips around the room, asking students to tell where they stand on the issue, briefly describing the position. After five to ten students respond, everyone determines his or her own position.

Alternatives Search - The teacher states a value-laden problem such as 'ways to save energy' or 'things to do to improve the playground environment,' and asks students to individually brainstorm solutions to the problem (three to five minutes). Students then, in groups of three or four, combine individual lists, add new solutions, and choose the three alternatives they like best and rank order these (in about ten minutes). Groups report results to the class.

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Values Wheel - Teacher reads a percentage question, asking students to record their answers on an individual circle which they divide into pie-shaped segments representing the relative strength of their answers. Each student chooses a partner and discusses the reasons for the valuation (approximately two minutes).

Values Auction - Items listed to be sold at an auction to the highest bidder, according to the following rules. You are to pretend that you have none of the items listed; you have a total of $5,000 to spend; and you can spend no more than $2,500 on any one item. Bids must open at no less than $50 and no more than $100.

Role Playing - An environmental current event issue is described and students assume roles of individuals who are seeking solutions to the problem.

Values Grid - List some general issues, such as water pollution or population control. Next to the issue students privately write a few key words to summarize their position on each issue. The teacher reads the following questions:

a) Are you proud of (do you prize or cherish) your position?
b) Have you publicly affirmed your position?
c) Have you chosen your position from alternatives?
d) Have you chosen your position after thoughtful consideration of the pros and cons and consequences?
e) Have you chosen your position freely?
f) Have you acted on or done anything about your beliefs?
g) Have you acted with repetition, pattern or consistency on this issue?

For each issue, students check the appropriate box if they can answer the question affirmatively.

Values Voting - After each question is read, the students take a position by a show of hands. Affirmative, hands up; negative, hands down. The undecided fold their arms. Discussion is tabled until all questions have been completed.

Rank Order - Teacher presents three or four alternative choices for responding to each question (generally written on the board), and asks students to rank order the choices, on paper, according to their own preferences. Teachers call on six or eight students to give their rankings. Discussion follows.

The dolphin controversy was chosen as a representative case of using environmental current events in the classroom. The following background information was gathered from magazines and newspaper clippings, TV news and current publications.

Dolphin, accidental victims of the tuna fishermen, have become a critical issue. Yellowfin tuna, a high protein source for an overpopulated, underfed world, have endangered the status of the dolphin. Tuna fishermen use the dolphin to find the yellowfin tuna because both species of fish swim and feed together. In 1974, an estimated 255,000 dolphin were accidentally caught and drowned in the purse-like net set for tuna.

Research into the fishing methods and gear of the tuna fishermen have lowered the accident rate. However, one way to avoid killing the dolphin is to return to line-fishing which is not economically feasible.

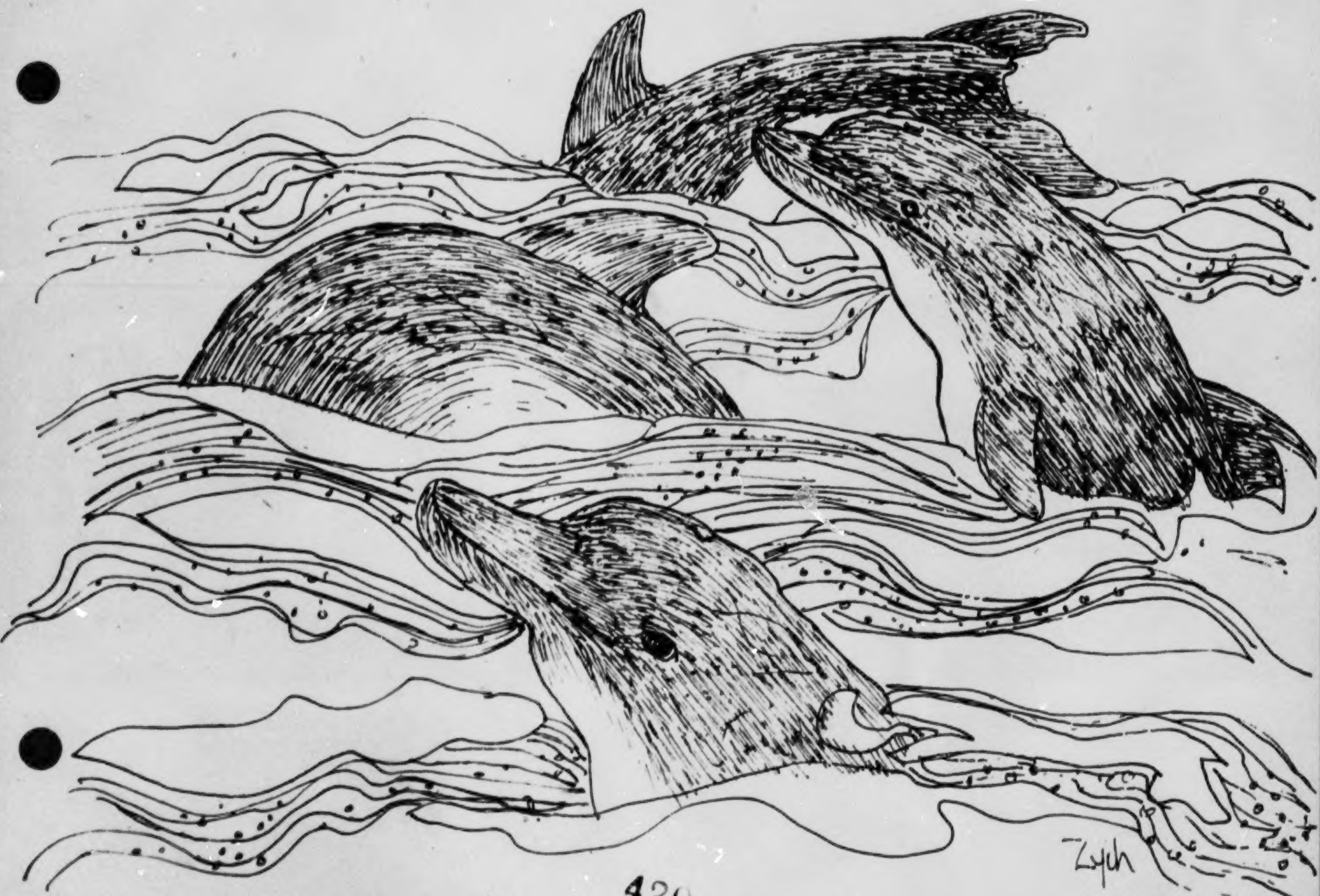
In this activity students are presented with the problem situation: in 1977 a ruling induced fines and jail sentences for offenders of a dolphin allotment ruling. A search for solutions to the problem should be generated by classroom groups. The compromise solution is evolved through brainstorming. The actual compromise reached by tuna fishermen and marine authorities is as follows: sentences were cleared because dolphin kills were proclaimed not criminal. However, the quota regulations system was maintained. As a result, cautious fishermen have lowered their dolphin kill significantly. In 1977, .25 dolphin per ton were killed, a drop from the 1 dolphin per ton killed in 1976.

Before You Begin

MATERIALS: duplicates of student page, pencil, paper

Words To Know

dolphin, porpoise, consequences, mammalian, values clarification, quota, seine, controversy, species, fluke



ACTIVITY

1. Divide class into groups.
2. Read problem situations.
3. Guide students in an Alternative Search as mentioned in teacher background.

Related Activities

Write to the tuna canning companies and find out what they are doing to save the dolphin.

Resources

O'Donnell, "A Tunaboat goes fishing," Current Events, Vol. 77, Xerox Educational Publications, November 16, 1977, pp 4-8.

The Whalebook, Endangered Species Productions, Boston, Mass., May, 1974, EEC #726.

Credit

Drawing: Cecelia Zych

Notes To Myself

STUDENT PAGE

DIRECTIONS: READ THE ARTICLE BELOW. THEN ANSWER THE QUESTIONS.

Warm blooded, air breathing mammals are being slaughtered in the seas. Because dolphin are mammalian, they must surface to breathe air. When the dolphin surface, they signal nearby tuna boats of the possibility of a yellowfin tuna catch, as it is well known that dolphin and tuna feed together. Speedboats surround the tuna, which swim under the dolphin. Nets are lowered. As the purse-like net is drawn tight, tuna and dolphin are caught. The fine mesh of the net, or seine, tangles on the snouts or flukes of the dolphin, drowning them before they can be released. Although the deaths of the dolphin are accidental, they are many. In 1972, as many as 375,000 dolphin were killed. Such high kills led to the passing of laws to protect the species. In 1977, a quota was set prohibiting fishermen from killing over 59,050 dolphin each season. For killing rare species of dolphin a fisherman could loose his fishing license, be fined $20,000, or spend a year in jail. To oppose these penalties, many fishing crews refused to work and the tuna industry was forced to lay off several hundred workers.

QUESTIONS:

1. HOW WOULD YOU SOLVE THIS CONTROVERSY? MAKE A LIST OF YOUR IDEAS.
2. IN GROUPS, COMPARE YOUR INDIVIDUAL LISTS OF SOLUTIONS. CAN YOU ADD ANY OTHER IDEAS TO THE LIST?
3. CHOOSE THE BEST THREE IDEAS TO REPRESENT YOUR GROUP. RANK ORDER THESE.
4. REPORT THE RESULTS TO THE CLASS.

Solid Waste and Energy

Curriculum Topic
ENERGY FORMS

Environmental Topic
ENVIRONMENTAL ETHICS

Skills
Generating alternate solutions

Subject
Science

Grade Level(s)
3 - 5

Site
Classroom

Author
Arthur C. Braun, Jr.
Antoinette R. Giovannitti

Objective

The student will be able to:

1. explain two alternative solutions for the use of disposed items.

To The Teacher

Energy can be stored in many different ways. It can be stored in a book or on a table, a pile of coal, a battery or a stretched spring. This stored (potential) energy can be changed to other forms of energy such as kinetic, chemical, electrical, heat and mechanical energy (i.e. falling water has kinetic energy. At Niagara Falls some of the falling water is used to rotate turbines near the bottom of the falls which in turn operate generators which produce electricity).

Wood, and one of its by-products, paper also contain energy which can be released in the form of heat. Today, however, this potential energy is being wasted. Often paper and wood are buried in dumps or landfills. The potential energy of the paper is lost forever. Disposal of waste is also presenting a social environmental problem through the disposal of solid waste in land areas that can potentially pollute water supplies.

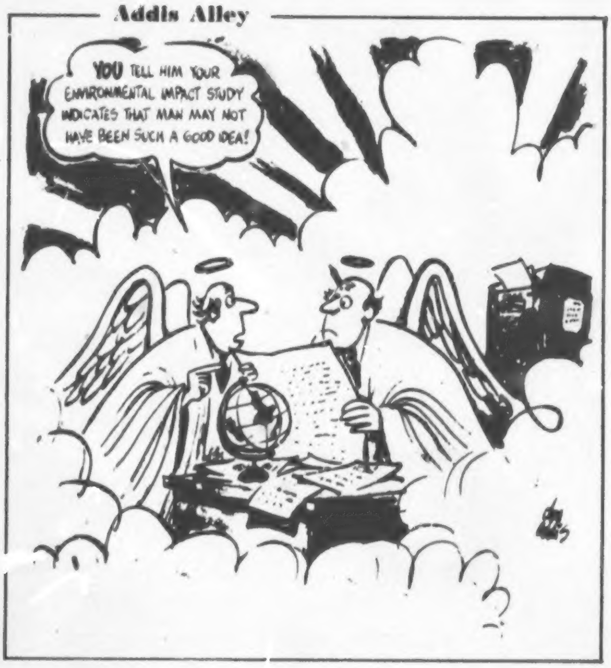
Before You Begin

Materials: trash (solid waste) from the classroom wastebasket, box or newspaper

Caution: Take appropriate sanitary precautions when students sort through the accumulated solid waste.(i.e. half eaten candy, chewed gum, soiled tissues, etc.).

Words To Know

litter, gaseous liquid, accumulation, salvage, tidy, dispose, quantity, solid waste, discard, biodegradeable, sanitary, recycle


Addis Alley
YOU TELL HIM YOUR ENVIRONMENTAL IMPACT STUDY INDICATES THAT MAN MAY NOT HAVE BEEN SUCH A GOOD IDEA!

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Conservation News 3-1-74

ACTIVITY

1. In the latter part of the day, have the students pick up any paper or other litter dropped on the floor or thrown into their desk.

2. Place box or newspapers and wastebasket side by side in section of the room.

3. Have students place all materials in a pile on the newspapers (or in a box).

4. Empty wastebaskets in another pile.

5. Ask the students:

    a. What state of matter does this represent? (solid) Write response on board.

6. Discuss the new definition of "solid waste." (Definition: Item that remains in a solid state at the time of disposing; not consumed by its user, i.e. pencil, eraser etc.)

7. Point out that society has problems with the disposal of gaseous and liquid wastes, however, it is the collection of solids which we throw away that is becoming our most serious problem.

    a. The solid waste is potential energy. What is energy? What do we mean by potential energy?

    b. How can we use the "solid waste" so that its potential energy can be released?

8. Refer back to the piles of solid waste. Note that the wastebasket is a tidier way of disposing of classroom wastes than littering on the floor, but both are solid waste. What happens to the material in the wastebasket? How is it disposed of?

9. Discuss the following questions:

    a. What type of material is found in the greatest quantity in this accumulation?

    b. Which items could be salvaged? (Large pieces of paper with little written on them, rubber bands, crayons, pencils and paper clips are examples.)

    c. What does this tell you about our habits of discarding things?

    d. How can some of the wasted items be re-used? (Memo pads from discarded paper, milk container planters and writing on both sides of the paper are examples.)

    e. What does recycling mean? Which things can be recycled?

    f. How does solid waste create problems?

    g. Do we need all the things we use? Is there any danger that some of the solids we are using might some day be used up? (aluminum, copper, paper)

    h. Why do Americans use and waste so many things?

Related Activities

1. Have the school set up a newspaper collection center for recycling.

2. Find out how our community disposes of solid waste.

3. Make a graph and compare the waste and use of materials between three different countries and the United States.

Resources

Living Within Our Means: Energy and Scarcity, Environmental Education Instructional Activities, K-6 Yorktown Heights, New York.

Credit

Oklahoma Energy Awareness Education Energy Education Activities K-3, Oklahoma State Department of Education, Leslie Fisher State Superintendent of Public Instruction, 1977, p. 181-182.

Notes To Myself

Protecting Our Water

Curriculum Topic

MAN'S ECOLOGICAL ROLE
WATER POLLUTION

Environmental Topic

ENVIRONMENTAL ETHICS

Skills

Problem solving, valuing scientific skills

Subject

Social Studies/Science

Grade Level(s)

3-5

Site

classroom, home, field trip (pond, beach, reservoir)

Author

Arthur Braun, Jr.
Antoinette R. Giovannitti

Objective

After completing the activity, students will be able to:

1. describe in written form how water is necessary to support a diversity of living things
2. tell five ways in which human beings protect the earth

To The Teacher

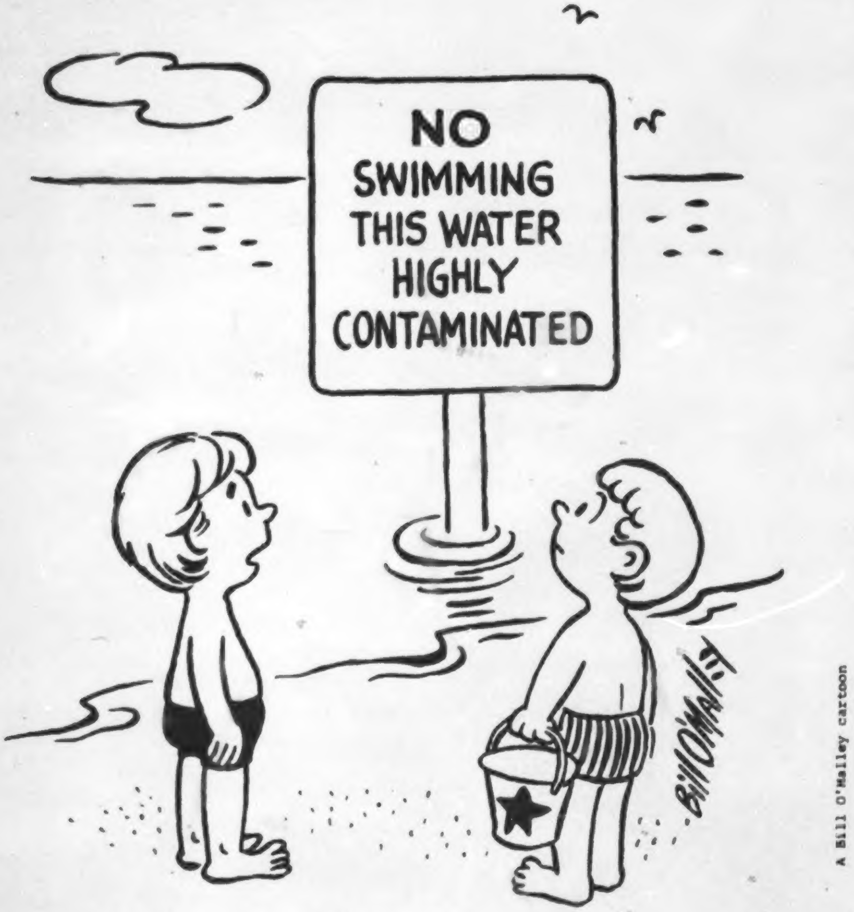
From the time of the early explorers of the New World, water was an easily available, clean and abundant resource but a lax attitude toward the need for conserving it, presents us today with a need to inform future citizens of their role in protecting the waters of our earth. It is a role which requires active involvement today for the survival of interdependent living things tomorrow.

Before You Begin

library
text books, picture books
magazines and newspapers
large chart paper (for wall charts)
magic markers
colored stars (3 colors)

art materials: crayons, construction paper

SEE ACTIVITY ON NEXT PAGE.


NO SWIMMING THIS WATER HIGHLY CONTAMINATED
Bill O'Malley

A Bill O'Malley cartoon

"KIN FISH READ?"

Conservation News 6-1-74

Resources

Stapp, W. B. and D. A. Cox, Environmental Education Activities Manual, III pp. 59-60

ACTIVITY

1. Elicit ideas about water uses. This may be facilitated by passing out the magazines and books (library). Discuss with the children as many uses as they can think of for clean water.

2. Divide class into groups. Have children write their ideas on large papers or blackboard.

3. After completing this list, describe the key:

A. Gold stars to indicate human uses of water which support life.
B. Blue stars to indicate human uses for enjoyment.

C. Green stars to indicate non-human uses.

4. Using this key, each group should then apply it to the lists they have compiled in step 2.

5. Using the same procedure, list the things that pollute water:

A. Four yellow checks beside pollutants which affect human survival.

B. Blue checks beside pollutants that would spoil fun and enjoyment among people.

C. Green checks beside pollutants which affect non-human life or environment.

6. Discussion: list ways available to individuals and families for keeping or helping to keep water clean. (e.g. bio-degradable detergent; litter baskets) Use books, the ideas of other people and private observations as sources for ideas.

7. Further discussion: what would happen to people (and animals) if our waters became polluted? For orange juice and iced-tea, to say nothing of water in its pure state, water would have to be purified. (In order to survive, humans require at least one gallon of water per day.) Discuss other uses of water: clothes, auto and window-washing, watering of lawns, etc. If animals are affected, the food chain is broken and human survival further threatened.

Related Activities

1. Each student chooses two ways to clean water and maintain it in a cleaner state: one personal project, one family project.

2. For each of these projects, the student will keep a progress record.

3. Evaluation:

A. At the end of two weeks, teacher and individual students evaluate projects. Modify or continue the original projects for two more weeks.

B. After a final evaluation, share conclusions with class.

4. Make bulletin-board display of crayon, chalk or magic-marker drawings made by children to show ways in which water is polluted.

World's Largest Monument to the World's Smallest Fish

Curriculum Topic

MAN'S ECOLOGICAL ROLE
ECOLOGY

Environmental Topic

ECONOMICS, TECHNOLOGY and CULTURE;
ECOSYSTEMS

Skills

Problem solving

Subject

Science, Social Studies

Grade Level(s)

Adaptable

Site

Classroom

Author

Cyndi Walsh

Objective

At the conclusion of this activity, the student will be able to propose and defend reasons for a decision.

To The Teacher

The purpose of this activity is to involve the students in a contemporary Supreme Court decision which concerns a vital environmental issue. For the first time in history in 1978, the Supreme Court of the United States had to make a conscious decision to let live or liquidate a species of life. In a 6 to 3 decision, the Court ruled in favor of the Endangered Species Act by halting a $119 million project already near completion. The snail-darter, a three-inch fish found nowhere on earth but at the project site will be allowed to live. As the Governor of Tennessee said, "We have the world's largest monument to the world's smallest fish." (See To the Teacher for background.)

Before You Begin

Materials: paper and pencil, duplication of the information sheet for the members of the class

Words To Know

extinct, endangered, transplanting, floodgating, TVA

ACTIVITY

1. Introductory question: Ask the class to name a fish they could catch in a river. Can they name an endangered species? Ask if they have heard of the snail-darter fish.

2. Pass out information sheet and read aloud.

3. After reading the information sheet, ask the class to consider solutions to the snail-darter dilemma.

4. Conduct a brainstorming session. Later, list the suggested alternatives on the board. (See Teacher Notes for complete list.)

5. Divide the class into three groups to represent
   a) the Tennessee Valley Authority
   b) environmentalists
   c) unemployed residents of the county.

6. Ask each group to rank the alternative solutions that best meet their needs, according to the roles they are playing.

7. Ask one representative from each group to join a summit group in which the needs and decisions of each interest group will be shared.

8. Explain transplanting and floodgating alternatives and discuss why they have failed. (See Teacher Note.)

9. Ask class to make personal decisions (private ballot) to stop or continue the project.

10. Tell the class of the Supreme Court ruling and discuss its implications for the future.

Hints to the Teacher:

1. Transplanting was unsuccessful: only adult fish were found, indicating that spawning had been unsuccessful.

2. Floodgating did not allow adult fish to return upstream to spawn - a necessary part of their lifecycle.

3. Alternatives considered by TVA, environmentalists and Congress:

   a) leave the dam standing as a monument to our environmental responsibilities,

   b) transplant the fish

   c) amend laws

   d) put bounty on snail-darter fish found in other places

   e) use floodgates

Related Activities

Research other successful attempts to preserve wildlife habitats: investigate the habitats of the snowy egret, osprey, baleen whale, trumpeter swan, whooping crane.

STUDENT PAGE

STUDENT INFORMATION SHEET

THE TENNESSEE VALLEY AUTHORITY (TVA) IS AN INDEPENDENT GOVERMENT AGENCY FINANCED BY CONGRESS TO CONTROL THE WATERWAYS OF THE TENNESSEE RIVER BASIN, AN AREA OF 41, 000 SQUARE MILES. THE TVA BUILDS DAMS TO HELP NAVIGATORS, TO CONTROL FLOODS AND TO GENERATE HYDROELECTRIC POWER. IT ALSO ASSISTS IN SOIL AND FOREST CONSERVATION AND IN CREATING RECREATIONAL AREAS.

ONE OF MANY NEW PROJECTS FOR THE AREA IS THE TELLICO DAM, A $119 MILLION DOLLAR PROJECT DESIGNED TO CREATE A LARGE LAKE WITH A SHORELINE INDUSTRIAL PARK. THE PROJECT WOULD BRING JOBS TO LARGE NUMBERS OF THE UNEMPLOYED. NEAR COMPLETION, THIS PROJECT HAS BEEN HALTED. IT HAS BEEN LEARNED THAT IN THE THIRTY-EIGHT MILES OF CLEAR FREE-FLOWING WATER BELOW THE DAM THERE EXISTS A THREE-INCH FISH CALLED A SNAIL-DARTER, FIRST DISCOVERED IN AUGUST, 1973. ENVIRONMENTALISTS ARGUE THAT THIS SPECIES EXISTS ONLY IN THIS RIVER. IF THE DAM IS COMPLETED, THE SNAIL-DARTER WILL BECOME EXTINCT.

THE SUPREME COURT OF THE U.S. MUST DECIDE TO LET THE FISH LIVE OR TO MAKE AN HISTORICAL CHANGE IN THE CURRENT ENDANGERED SPECIES ACT BY ALLOWING THE TELLICO DAM PROJECT TO CONTINUE THEREBY ELIMINATING A SPECIES OF LIFE. WHAT WOULD YOU DECIDE?

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TAXONOMY OF SKILLS

I. BASIC SKILLS -

Reading
Writing
Computing
Listening
Speaking
Analyzing

II. ACQUISITION AND/OR VERIFICATION OF INFORMATION

A. Information Skills

1. Locating and obtaining information (reading, listening, or observing).
2. Organizing information
3. Using information for a purpose
4. Communicating information (orally or in written form)
5. Evaluating information

B. Data Skills

1. Collecting and compiling data
2. Interpreting data
3. Infering from data
4. Graphing data
5. Mapping data
6. Measuring
7. Constructing hypothesis
8. Testing hypothesis
9. Predicting

III. PROBLEM-SOLVING SKILLS

Listening with comprehension

Recognizing problems

Defining problems

Locating and obtaining information

Organizing information

Analyzing information
Generating alternate solutions
Developing a plan of action

IV. VALUING SKILLS
Identifying alternatives
Identifying consequences of alternatives
Identifying feelings about alternatives
Choosing freely

V. OTHER SKILLS
Classifying
Observing
Experimenting
Concluding
Constructing models
Reading maps
Interpreting maps
Brainstorming
Implementing
Intuiting

VI. PERSONAL SKILLS
Developing self confidence

VII. GROUP SKILLS

VIII. CITIZENSHIP SKILLS

EARTHWATCH Activity Feedback Form

Activity____________________ Leader__________

Age Level________ No. of Children______ Position__________

Activity Site:__________________ Address__________

Approx. minutes spent on activity________

COMMENTS____________________

	YES				NO
1. I had a lot to explain before starting the Activity.	5	4	3	2	1
2. Background information was just what I needed.	5	4	3	2	1
3. Instructions were easy to follow.	5	4	3	2	1
4. Children were interested.	5	4	3	2	1
5. Suggested discussion questions worked well.	5	4	3	2	1
6. How many of the "Related Activity" suggestions were used?	5	4	3	2	1
7. I will use this activity again.	5	4	3	2	1
8. Student Pages (if supplied) were useful.	5	4	3	2	1

Please describe, on the back of this card, any adaptations you made or improvements you suggest.

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